UNIVERSIDADE FEDERAL DE SANTA CATARINA

PÓS-GRADUAÇÃO EM INGLÊS E LITERATURA CORRESPONDENTE

THE (UN)CONSCIOUSNESS OF SECOND LANGUAGE ACQUISITION

de

PAULA ALEXANDRA FATUR SANTOS

Dissertação submetida à Universidade Federal de Santa Catarina
para obtenção do grau de MESTRE EM LETRAS

FLORIANÓPOLIS
Setembro de 1994

Esta dissertação foi julgada adequada e aprovada em sua forma final pelo Programa de Pós-Graduação em Inglês para a obtenção do grau de

MESTRE EM LETRAS

Opção Inglês e Literatura Correspondente

Profª Drª Carmen Rosa Caldas-Coulthard

COORDENADORA

Profº Dr. Hilário Inácio Bohn

ORIENTADOR

BANCA EXAMINADORA:

Profº Dr. Hilário Inácio Bohn

Profª Drª Bárbara O. Baptista

Profº Dr. José Carlos Paes de Almeida Filho

Florianópolis, 30 de setembro de 1994.

To my father,
who said 'go for it',
and to Mauro,
who came along.

PREFACE

Having grown in a home where both parents are bilinguals has sparked in me a spontaneous interest in language. Having studied a second language in an educational setting has raised in me a high awareness of language. In a sense, this survey represents the realization of gradual, evolving exposure to second language: from home to school to research. Theories and claims about second language acquisition (SLA) have rarely been contrasted, despite the crucial role that they play in the development of a second language, either in a natural or educational environment. It is only recently that classifications of SLA theories have appeared in the literature, showing an attempt by researchers to find similarities and differences among existing theories. This study reviews the process of second language acquisition in SLA theories and discusses the notion of consciousness in the theories. A few comments are in order here.

First, only theories which deal with the cognitive aspect of learning are included. Second, the chapters which discuss these theories can be read in any sequence the reader may wish for they are modular in nature. And as they are self-contained, I decided to encapsulate the bibliographical references within each chapter. Third, the order in which the theories are presented resembles the order in which they were written. This somehow reflects the growth of the researcher in terms of writing ability, development of critical view, and power to analyse the theories. Fourth, it was felt that the abundance of technical terms might interfere with comprehension. Thus, for purposes of enhanced readability, a glossary for technical terms is provided at the end of this study.

I am very grateful to my advisor, Hilário Bohn, for providing an enriching environment of academic excellence that was crucial to this work.. I am also thankful to Prof. Michel Paradis, who kindly listened to my questions and answered them. Finally, I would like to make mine the words of a successful neurosurgeon from New York University Medical Center, Dr. Fred Epstein: 'We need the courage to pursue new concepts and ideas, otherwise the fear of being wrong keeps us from ever being right'.

THE (UN)CONSCIOUSNESS OF SECOND LANGUAGE ACQUISITION

PAULA FATUR SANTOS

UNIVERSIDADE FEDERAL DE SANTA CATARINA
1994

Supervising Professor: Dr. Hilário Inácio Bohn

ABSTRACT

This theoretical study aims at presenting what some important psycholinguistic theories of SLA say about the process of SLA in general, and about the conscious and unconscious aspects of this process in particular. It also compares the psycholinguistic view found in the SLA field with a cognitive psychological view, Ausubel's Assimilation theory. Similarly, it compares the psycholinguistic view with a neurolinguistic view, Paradis'. Such multi-disciplinary comparisons were provided because it is assumed that the SLA process is highly complex, involving multiple aspects and having to draw from multiple areas in order to be fully explained. The study results in a classification of psycholinguistic theories of SLA, according to their source-influence areas. Thus, theories were classified into Linguistics-based and Psychologically-based theories. The classification brings to light the two trends that permeate recent psycholinguistic research in SLA: one that argues for a conscious type of learning, the psychological trend; and one that argues for unconscious acquisition, which has its roots in Chomsky, the linguistic trend.

AQUISIÇÃO DE SEGUNDA LÍNGUA: CONSCIENTE OU INCONSCIENTE?

PAULA FATUR SANTOS

UNIVERSIDADE FEDERAL DE SANTA CATARINA
1994

Professor Orientador: Dr. Hilário Inácio Bohn

RESUMO

Este estudo teórico analisa o processo de aquisição de segunda língua, em geral, e os aspectos conscientes e inconscientes deste processo, em particular, nas mais importantes teorias psicolingüísticas de aquisição de segunda língua. Além disso, este mesmo processo é analisado em uma teoria psicológico-cognitiva, a teoria da Assimilação de Ausubel, e em uma teoria neurolingüística, a de Paradis. A busca de teorias multidisciplinares deve-se ao fato de que o processo de aquisição de segunda língua é *per se* altamente complexo, envolvendo múltiplos aspectos e, conseqüentemente, múltiplas disciplinas. A análise do processo nas teorias culmina numa classificação das mesmas. A percepção das áreas subjacentes às teorias foi o critério encontrado para classificá-las. Assim, elas foram classificadas em teorias que emanam da Psicologia, tendência esta que privilegia o aprendizado consciente, baseada na Psicologia Cognitiva, e que emanam da Lingüística, tendência que priviligia a aquisição inconsciente e que tem suas raízes em Chomsky.

TABLE OF CONTENTS

List of Figures

CHAPTER 1

INTRODUCTION

With the explosion of Cognitivism, marked by Piaget in Psychology and by Chomsky in Linguistics, the behavioral sciences entered a new era. Studies shifted from behavior as the object of studies to behavior as the means to understand the workings of the mind. Thus, the emphasis was placed on the mind, its processes, what underlying reasons cause a certain behavior.

Research in Second Language Acquisition (SLA) followed the above tendency, moving from research on teaching to research on the learning process. That move also marked the emergence of SLA as an independent discipline, when numerous issues related to the acquisition of a second language (SL) started to be studied. As a consequence, the field started to draw from the most diverse areas of knowledge -- Psychology, Linguistics, Sociology, Psycholinguistics, Sociolinguistics, Neurolinguistics (cf. Larsen-Freeman & Long 1991:5) -- and is expected to collaborate with these areas as well.

This multidisciplinarity was especially beneficial to the study of the process of second language acquisition. This process involves a diversity of variables, making it a very complex and controversial issue. The number of SLA theories that have been proposed in the literature is evidence of this. Larsen-Freeman & Long (ibid:227) suggest that there are over 40 theories of SLA. Each of these theories tries to explain acquisition from a specific viewpoint, be it the social, the affective, the cognitive, or some other. And even within the scope of a specific viewpoint, say, cognitive theories, there is controversy. For one thing, theories that follow a Chomskyan tradition often claim that the process is largely unconscious, a matter of triggering what is innately programmed. On the other hand, the cognitive-psychological tradition attributes much

consciousness to the process, all of which comes from experience. In any case, perhaps precisely because of its complexity and controversial nature, the SLA process is so amazingly interesting to researchers.

The complexity of the acquisition process can be better visualized when we consider the factors involved in it, such as the neurological, psychological, and social factors . All factors are sufficiently important in SLA to engage our most serious considerations, as they influence the learning process concomitantly and interact in various ways. Nevertheless, either set can be examined while the others are held constant. This applies to this present study of cognitive processes -- it looks at just a fraction of the whole learning process, but a fraction which seems to be more immediate, less tangential, more crucial in its impact on SLA than are affective and social factors. Figure 1 spells out the main factors involved in the SLA process:

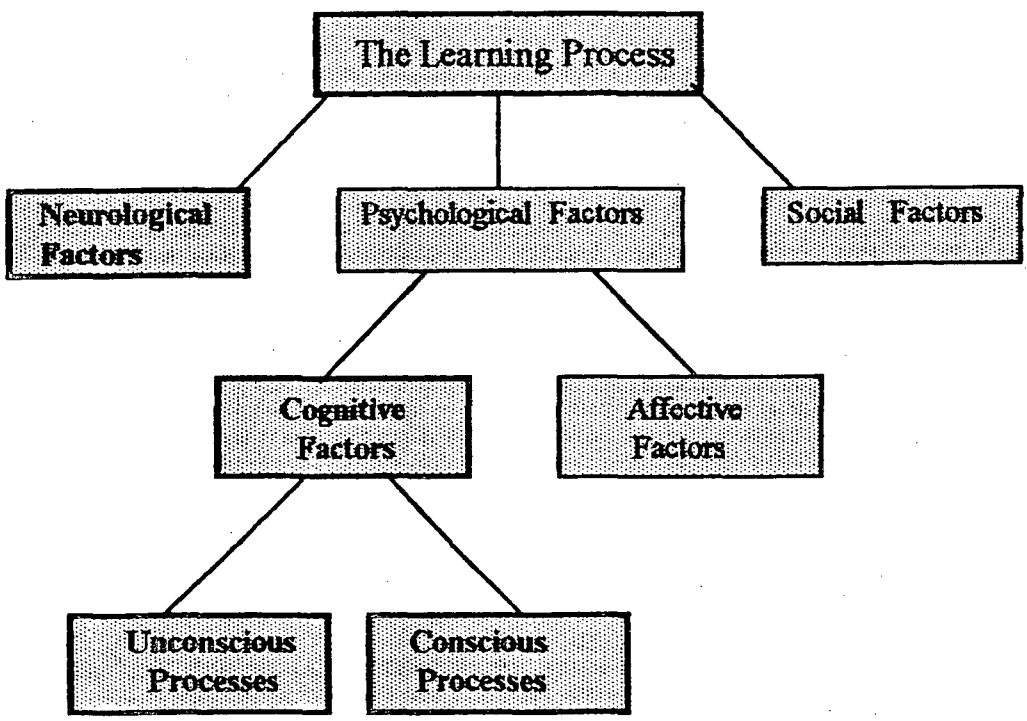


Fig.1 Factors involved in the learning process, highlighting the ones covered in this dissertation.

This theoretical study aims at presenting what some important psycholinguistic theories of SLA say about the process of SLA in general, and about the conscious and unconscious aspects of this process in particular. It also compares the views found in the SLA theories with a cognitive psychological view, namely, Ausubel's Assimilation theory. The comparison is due to a belief that a second language acquisition theory should draw from theories of learning and not only from theories of language since in many aspects cognitive development and language development overlap. Similarly, this study compares the psycholinguistic view with Paradis' neurolinguistic view, in order to provide a realistic neurologically feasible picture of the acquisition process. The study results in a classification of psycholinguistic theories of SLA according to the areas which constitute their source of influence, the criterion which was found to be the most relevant for the clarification of the psycholinguistic picture of SLA.

Cook (1993) describes the three aspects that a (psycholinguistic) theory or model of SLA should cover:

1. the description of the competence system, or mental grammar, in the Chomskyan sense, or knowledge about the language, as it has been called more recently,

2. the description of processes used to build (acquire) the competence system, or developmental processing, as called by Sharwood Smith (1991); and

3. the description of procedures to access the competence system, or the ability to use language, or, following Sharwood Smith's terminology, on-line knowledge processing.

In the following lines, I use Cook's description to determine the scope of this dissertation.

Concerning aspect number 1, when I say that a theory includes a description of the competence system in whatever form it may be, I do not mean only a description of the linguistic system as such, of its phonology, morphosyntax, and semantic constraints on the lexicon (the generative), or even a description of the network of information which constitutes language competence (the connectionist), rather, I also mean a description of the nature of the system, what the competence system consists of. Note that, when describing the nature of the system, I am not leaving aside the territory of metaphors and abstractions which characterize the descriptions of the competence system as such, like the generative and connectionist descriptions, but I am somehow going beyond the theoretical territory and going towards a realistic picture of how that competence system is realized in the mind, conceived as a real entity, made feasible. It must be clear that this realization (in the sense used above) is not free of metaphors and abstractions, for not only psychology but also neurology has to rely on metaphorical models and abstractions in order to explain how the mind works.

In some theories, aspect number 1 is inevitably linked to number 2, that is, the description of the acquisition processes and that of the representation of the linguistic system are inseparable (for instance, Sharwood Smith 1991). In others, aspect number 1 is implicit, that is, if the processes described in the acquisition of the linguistic system are said to be similar to Chomsky's description of L1 processes, we expect that this linguistic system refers to the generative /Universal Grammar model. This is the case in Krashen's and Prabhu's theories. Thus, aspect number 1 needs to be considered in order to show whether a theory stems from linguistics or psychology.

Aspect number 3, language processing, deals mainly with language use, a processing phenomenon that comprises the linguistic tasks of production and reception. The use of unconscious processes in these tasks is undeniable and

has been more and more described by psycholinguists (Jackendoff 1987; Sharwood Smith 1991). Cognitive psychologists Meichenbaum and Gilmore (1984:276) compare such processes to physiological processes:

> In the same way that we engage in a variety of physiological processes (breathing, stomach contractions, and so forth) without awareness, a similar analogy can be drawn to how we process information.

Misunderstandings involving aspect number 3 happen sporadically in theories that claim to be learning theories, when in fact they address language processing. This seems to be the case with McLaughlin (1987) in the first version of his theory, where he explained basically access to knowledge, but claimed to be presenting a cognitive theory of SLA. Because of criticisms of this kind (Cook 1993:267), his more recent version (1990) contains the notion of restructuring, a notion devised to explain knowledge acquisition. But in general, theories of language processing are well defined and self-contained so that at first it would seem possible to leave them out of a study that does not specifically address language processing, if it were not for one reason. The acquisition of language competence is only shown in performance. Thus, as is the case in this study, sometimes it is impossible to talk of language acquisition without talking of performance mechanisms.

While aspect number 1 deals with the description of the competence system, and aspect number 3 deals with procedures to access this system, in this dissertation I am concerned with aspect number 2, acquisition of the competence system.

Some clarifications about terminology seem in order. The first concerns the theories dealt with in this dissertation. I chose to call theories of SLA that deal with the cognitive aspect of the learning process psycholinguistic theories of SLA. My choice is principled, and it is explained in chapter 8, where I discuss

the recent polemics that involve the word psycholinguistics. The second concerns the use of the expression SLA. The range of SLA as an independent discipline has broadened significantly recently, and presently the term SLA encompasses the study of both a second and foreign language environments, irrespective of the differences between them. The same is true for the key terms acquisition and learning, the third terminological problem to be clarified. Acquisition has become a superordinate term for both of them, although originally acquisition refers to natural settings and learning to classroom settings. In this study, the terms are used interchangeably, irrespective of the differences between them, except where it is indicated that a specific meaning is ascribed to them.

Theories are first explained as a whole -- however briefly, the functioning of theories is explained -- with special emphasis on the process of SLA. Then, the theoretical constructs of the theories are analyzed. These constructs provide tools for a discussion of the conscious and unconscious aspects of each theory, and they reveal the areas which constitute the source of influence of the different theories. From the areas, a natural classification emerges.

An outline of the dissertation follows:

Chapter 2, Drawing from Psychology, reviews some important psychological issues that are useful to the present debate of conscious versus unconscious processes in SLA, drawing from the area that is generally in charge of explaining them: psychology. Ausubel's Assimilation Theory is also presented in this chapter in order to introduce the reader to a sound cognitive psychological theory of knowledge acquisition and acquaint the reader with his unique explanation of how knowledge is organized so as to form a cognitive structure.

Chapter 3 presents Krashen's Monitor Model. It discusses the distinction between acquisition and learning processes. It also evaluates how the notions of conscious/unconscious serve as the constructs of this theoretical model.

Chapter 4 deals with Prabhu's Task-oriented Approach. Actually, this is a pedagogical proposal rather than a SLA theory or model, but it was included in this study for the interesting tenets that underlie the approach and lead to the pedagogical procedures proposed, the tasks. In this chapter, thus, the tenets of his approach are discussed, as well as the cognitive value of the task for the acquisition process.

Chapter 5 introduces an experimental model -- Pienemann's Multidimensional Model. Initially, I consider his two dimensions of the learning process: the developmental and the variational. Then, I establish the theoretical construct of the model, namely, sentence processing.

Seliger's view of the language acquisition process is presented in chapter 6. First, I present the two kinds of knowledge, linguistic and metalinguistic, that he claims are involved in SLA. Second, I discuss his particular view of verbal reports and their validity for explaining certain complex issues.

Chapter 7 examines Sharwood Smith's view. First, the Pedagogical Grammar Hypothesis which belongs to the early phase of his work is analyzed. The analysis thereon will concentrate on the more recent phase, which is influenced by Fodor's modularity thesis.

In chapter 8, McLaughlin's Information-Processing Model, the cognitive exemplar of the learning of a second language, is examined. First, I trace Cognitive Psychology as its source of influence. Second, I discuss his emphasis of language use over acquisition. Third, I discuss later incorporations to the model, such as the notion of restructuring, which were inserted in order to account for linguistic idiosyncrasies.

Chapter 9 has a speculative nature. It reaches the point of classifying the theories analyzed in terms of their source-influence areas in order to clear up the picture of psycholinguistic research in SLA. In this way, it is somehow conclusive as far as the theories studied are concerned.

Chapter 10, Drawing from Neurolinguistics, incorporates the substantial contemporary contributions of a neuroscience into the discussion of the SLA process. It presents a realistic picture of how linguistic information is organized in the brain and the mechanisms used to acquire and access it.

In the concluding chapter, I pull together the insights gained from the study of SLA theories and the insights provided by neurolinguistics, thus achieving a state of the art on the issue of psycholinguistic processes used in SLA. Pedagogical implications of the proposed view are also considered.

Although I have attempted to describe the processes found in the various theories/models extensively and profoundly, this was not always possible due to the obscurity and subjectivity that permeate the theories. The subjectivity lies, among other things, in the lack of precision of terms, which are widely used but whose real meaning is never made clear to the reader. Thus, we are obliged to infer without being sure how much we can infer from what is said. The obscurity seems to be a reflex of the present state of research about the 'black box' -- it seems that authors are just feeling their way within the SLA field: hypothesizing, speculating, theorizing. While this happens, other fields (such as the Cognitive Sciences) start to take over research matters that previously belonged to SLA. Or is it SLA that is moving towards these fields? In any case, a chance must be given for SLA research to show how much it has come to know about the 'black box' in these twenty years of research as an independent discipline.

REFERENCES

Cook, V. 1993. *Linguistics and Second Language Acquisition*. London: MacMillan Press.

Jackendoff, R. 1987. *Consciousness and the Computational Mind*. New York: Academic Press.

Larsen-Freeman, D. & M. Long. 1991. *An Introduction to Second Language Acquisition Research*. New York: Longman.

McLaughlin, B. 1987. *Theories of Second Language Learning*. New York: Edward Arnold.

McLaughlin, B. 1990. Restructuring. *Applied Linguistics* 11(2):113-28.

Meichenbaum, D. & J.B. Gilmore. 1984. The nature of unconscious processes: a cognitive-behavioral perspective. In: Bowers, K.S. & D. Meichenbaum (eds.) *The Unconscious Reconsidered*. New York: Wiley.

Sharwood Smith, M. 1991. Language models and bilingual processing. In E. Bialystok (ed.) *Language Processing in Bilingual Children*. Cambridge: CUP.

CHAPTER 2

DRAWING FROM PSYCHOLOGY

'The value of consciousness in human life is something which extends across philosophy to psychology and to linguistics.'

Vivian Cook (1993:68)

In this chapter, I discuss some important concepts to this dissertation borrowed from psychology. I first discuss the nature of unconscious processes and contents, as proposed by Reber in Experimental Psychology. I also take on Chomsky's view of the unconscious, although he is traditionally considered a linguist. Then, I present the concepts of unconscious processes and unconscious knowledge as they should be understood in this dissertation. Finally, I briefly explain the most typical exemplar of a cognitive psychological theory, namely, Ausubel's Assimilation Theory.

The nature of unconscious processes and contents

According to experimental psychologist Reber (1989), devoted to the study of implicit learning and unconscious cognitive processes, consciousness is a mental state of late origin. 'The proper stance is to assume that unconscious mental states are the foundations upon which emerging conscious operations are laid' (ibid:230). As to the nature of unconscious cognition, he assumes that we have a primitive unconscious that we share with all corticated species. And we have a sophisticated unconscious which has a basic difference from the former -- its processes, which all depend on a rich, abstract knowledge base which controls perception, affective choice and decision-making independently of consciousness. The primitive unconscious is active and fundamental for survival. Three points are important for the comprehension of the functioning of the primitive unconscious:

1. The pickup of information takes place in the absence of awareness of what is being picked up (implicit learning).

2. Much of what is acquired can be explained/ articulated/verbalized consciously, but the amount that is stored is much greater than the amount that can be explained.

3. The function of the primitive unconscious processes (which are automatic) is 'to pick up critical knowledge about categories and about co-variations of aspects of categories' (ibid:231). Such knowledge is not related to meaning, affect, or interpretation -- these belong to the sophisticated unconscious.

The sophisticated unconscious depends on previously acquired knowledge, whereas the primitive has the function of acquiring such knowledge. There are other differences between them. The sophisticated unconscious is generally available to consciousness, that is, there is awareness of the knowledge base itself. The scope of this awareness, however, is greater than the scope of the covert base. In other words, the possibility of information of the knowledge base becoming conscious is greater than of it remaining unconscious. These bases work at a symbolic level. They all involve semantic and affective properties. It is similar to what is generally known as cognitive structure.

Chomsky's view of the unconscious

Chomsky (1980 cited in Bowers & Meichenbaum 1984:156) considers unconscious processes those which are inaccessible *in principle*, that is, it is possible to 'acquire knowledge of their presence and activity by inference, but not by means of direct, immediate introspective awareness'. Unconscious knowledge (or tacit, innate) is in the mind, it is employed in the service of ongoing cognitive processing, but is not accessible to introspection. It is active, but not reachable. Besides, unconscious linguistic knowledge is basically the same for every speaker-hearer (universal).

If we compare Reber's definition and Chomsky's, we will see that in both senses of the word, the psychological and the linguistic, the unconscious is active rather than dormant; and in both cases, unconscious mental processes operate on different principles than conscious ones. But both definitions conform to the general principle in psychology (Bowers & Meichenbaum 1984:156) that there is an unconscious level of mental activity which influences behavior in one way or another .

Unconscious processes and knowledge

In order to provide the reader with a definition of the unconscious congruent with the notion used in this study, I will take the meaning that is most often implied in learning theories as well as in language theories. When I speak of the unconscious in such theories, I am referring either to the unconscious process of learning or to the product of this process, unconscious knowledge. When the process is under consideration, then this is implicit learning, a type of learning of complex skills, such as a language, held outside awareness. When we refer to the product of this process, it is tacit knowledge that we are referring to, knowledge that is internalized but not verbalizable. It is possible to relate such notions with those posed by Reber as to the nature of unconscious processes: implicit learning involves the use of the primitive unconscious. The result of implicit learning is tacit knowledge, whose probability of being unavailable to verbalization is high.

Actually there is no clear border line as to which cognitive processes used in acquisition are unconscious and which are conscious. Claims are often the result of speculation of researchers. What we can say is that some processes have a higher probability of being used unconsciously, although it is safe to say that this is polemical. Here I list some of them, frequently cited in psychological and linguistic literature (Ausubel 1978; Snow [in press]; McLaughlin 1978:321-

3): induction, deduction, inferencing, hypothesis-formulation and testing, transfer, acquisition heuristics (as posed by McLaughlin:ibid) such as overgeneralization, avoidance, imitation, simplification, Slobin's operating principles (see glossary). Problem-solving can be considered an unconscious process when it is a means to achieve a major goal. When it is a goal per se, it is a conscious strategy. But in that case, the step-by-step procedures that lead to the solution of the problem are unconscious, since the focus of attention on the goal to be achieved turns the attention away from the procedures.

In this study, it is presupposed that both conscious and unconscious processes are involved in SLA, but it is asked what role each of them plays in the SLA process and how they are characterized in SLA theories.

Having discussed some concepts relevant to the rest of this dissertation, I will now describe a cognitive psychological view of the acquisition of knowledge. The outstanding name here is Ausubel, who has the most complete, unparalleled theory, about the acquisition of knowledge, the Assimilation Theory.

Ausubel's Assimilation Theory

David Ausubel has had a significant impact on our present understanding of the process of learning, particularly learning in an educational setting. His book *Educational Psychology - A Cognitive View* is a classic in the field of educational psychology. The Assimilation Theory, as labeled by Ausubel and his associates, contends that the learner's present knowledge plays a critical role in the process of future learning. His theory of learning has a more cognitive focus than an affective-social one, and so the contribution of his thought may be fully appreciated in the context of discussion on cognitive variables in learning.

One of the model's greatest strength qua theory is that all knowledge is hierarchically organized in the learner's mind and that this prior structured knowledge is the most important factor at the time of learning, determining the

learner's capacity for acquiring new concepts or information. Ausubel (1978:163) puts it this way:

> If I had to reduce all of educational psychology to just one principle, I would say this: The most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly.

Prior knowledge in this case is characterized as the **quantity** and **organization** of the learner's present knowledge which is made up of information, concepts, ideas, facts and propositions. This body of knowledge constitutes the learner's **cognitive structure.** Ausubel maintains that the most inclusive ideas are set at the top of this structure, thus maintaining a hyponymical organization.

Based on his observations of the learning process, Ausubel assumes that learning takes place in the student's mind through a process of meaningfully relating new concepts to old concepts in cognitive structure. For the present, perhaps, it is necessary to distinguish the properties of cognitive structure that influence learning.

First, the learning of new information is a function of the existence of relevant anchoring ideas. These anchoring ideas occupy a more general, inclusive position in the structure of knowledge and serve as cognitive hooks or pegs on which new ideas can be hung.

A second major property in learning is the discriminability of new concepts from old anchoring ideas in cognitive structure. The assumption here is that existing knowledge is dominant and new knowledge is subservient whenever they are similar in nature. In such a case, old knowledge takes over the cognitive field and superimposes itself on similar new knowledge.

A last factor affecting learning is the stability and clarity of the established anchoring ideas. A stable and clear cognitive structure provides strong anchorage for new informational units, whereas unstable and ambiguous

knowledge provide weak anchorage for new material which will result in poor learning.

In his discussion Ausubel distinguishes two independent dimensions of learning along which all learning can be located. The first dimension is the reception-discovery dimension. The essential feature of reception learning is that the content of the learning task is given to the student. Under this circumstance the learner is required to comprehend the material and to incorporate it into his cognitive structure. In discovery learning, on the other hand, the information to be learned is not given; the student must determine what information is to be acquired before it can be established into the his/her cognitive structure. The importance of this first distinction becomes clear when we consider Ausubel's claims that people as a whole acquire a massive body of knowledge primarily through reception learning.

The second contrasting dimension is the rote-meaningful continuum. The crucial factor in determining whether learning is rote or meaningful is the relevance or significance with which the new material is handled. Rote learning is a process in which new material is related to prior knowledge through arbitrary associations. That is, it involves the collection of new ideas bearing little or no relationship with the existing cognitive structure.

Meaningful learning is a process in which new material is related to prior knowledge through logical associations. That is, it involves meaningful interaction of new material with the existing cognitive structure. The very fact that material is associable with stable cognitive hooks accounts for its anchorage or meaningfulness.

The significance of the rote--meaningful learning continuum is perhaps best appreciated when we consider retention of learned material for long periods of time. Meaningfully learned material has far greater potential for retention, whereas rote learning is less productive and less retrievable. Try, for instance,

to recall where, who with, what you were doing on Feb 18, 1988. It is unlikely that you will remember anything, unless this date is relevantly associable with a special event in your life.

In short, the key concept in Ausubel's Assimilation Theory is that learning must be meaningful. The learners must understand what is to be learned; relate it to their present knowledge in a rational, nonverbatim manner, and integrate the material being learned into their own cognitive structure.

I consider the learning process proposed by Ausubel clearly conscious. The assimilation of new knowledge is more feasible if it is relevantly associable with prior knowledge. It is the learner's task to perceive relevant associations between what s/he already knows and what is to be learned. The learner, then, is in a position to deliberate what is learned or not. This decision involves consciousness.

To what extent does Ausubel's cognitive theory apply to SL learning? Learning a second language involves both conscious and unconscious aspects, that will be unraveled throughout this dissertation. The conscious aspects are very well explained by the Assimilation Theory. However, the learning of an SL has peculiar aspects that develop in their own idiosyncratic way. Such aspects are known to undergo another type of learning, basically unconscious. This type is mostly explained by what I call linguistics-influenced theories, that will be discussed in the following chapters. But irrespective of the type of learning, Ausubel offers a powerful and thorough explanation of how knowledge builds up the cognitive structure.

REFERENCES

Ausubel, D., J. Novak & H. Hanesian. 1978. *Educational Psychology: A Cognitive View*. New York:Holt, Rinehart and Winston.

Bowers, K.S. & D. Meichenbaum (eds.) 1984. *The Unconscious Reconsidered*. New York:Wiley.

Cook, V. 1993. *Linguistics and Second Language Acquisition*. London:MacMillan Press.

McLaughlin, B. 1978. The monitor model: some methodological considerations. *Language Learning* 28(2):309-32.

Reber, A.S. 1989. Implicit learning and tacit knowledge. *Journal of Experimental Psychology: General*. 118(3):219-35.

Snow, C. In press. Bilingualism and Second Language Acquisition. In J. Berko Gleason & N. Bernstein Ratner eds.), *Psycholinguistics Today*. New York: Holt, Rinehart and Winston.

CHAPTER 3

THE MONITOR MODEL

In this chapter I briefly describe how the Monitor Model explains the second language acquisition process. After that, I develop the concept of acquisition process, or the internal cognitive ability responsible for the building up of language competence, as proposed by Krashen. Another aspect of the first hypothesis of the model, the acquisition--learning hypothesis, is discussed, then,the non-interface hypothesis. The final sections are concerned with criticisms of Krashen's model, as far as the first hypothesis is concerned. One criticism I raise is of the inconsistent use of the term subconscious. The others are related to Krashen's empirical evidence, or the lack of it.

The model

Krashen proposes a theory for building competence in a second language based on two independent processes, acquisition and learning. Acquisition is a subconscious process, similar or identical to the one children use to acquire the first and second languages in natural environments. It is sometimes referred to as an innate 'ability' for the acquisition of languages. Learning is a conscious process, involving internalization of the rules of the language and the ability to talk about them, normally brought about by instruction.

Besides this innate cognitive ability for the acquisition of languages, other conditions must be met for the acquisition process to take place, according to the Monitor Model: the adequate input (comprehensible input) must be provided to the learner, and the learner must be 'open' to this input by acquiring in an atmosphere in which s/he is not anxious, thus keeping his/her 'affective filter' low. These conditions constitute the other hypotheses that form the Monitor Model, but they will not be developed here because they are not

relevant to this study, since the focus here will be on the conscious/ unconscious issue.

The cognitive ability

According to Krashen et al. (1978:73), acquisition refers to the creative construction process. It is a product of the LAD -- the Language Acquisition Device postulated by Chomsky, the difference being that the Chomskyan LAD did not depend on input to the same extent that Krashen's does: acquisition is a 'subconscious process for developing ability in language via the language "mental organ".[Chomsky 1975] Requires comprehensible input' (Krashen 1985:100). In this process, the learner already starts with basic assumptions or constraints on the language and develops along a pre-ordained sequence, known as the natural order. Krashen does not tell us much about this sequence, nor about the processes responsible for it.

One thing that he does tell us about acquisition is that it involves hypothesis-testing, a process which takes place on a subconscious level of the mind (ibid:36). This process refers basically to the formulation of hypotheses, examining the input for confirmation or disconfirmation of the hypotheses (testing them), firming them up into rules, reorganizing the rules. Bley-Vroman (1986) and Snow (in press) support the claim that the processes of hypothesis-testing and rule generation operate in the second language learner. Evidences listed by Snow (in press) are: (1) the occurrence of 'developmental errors' by second language speakers, i.e., errors which are explainable as overgeneralizations based on features of the target language rather than interference from features of the native language, for example, *foots, hided, comed*; (2) recapitulation of the same order of acquisition shown by first language learners; (3) similar acquisition for speakers of different language

backgrounds; and (4) identifiable strategies of acquisition similar to those of young first language learners, such as imitation of chunks or 'modular patterns'.

Despite the fact that Krashen does not explicitly address Universal Grammar (UG) when explaining his model, we cannot separate the workings of the LAD from the Chomskyan notion of UG. Krashen's reliance on Chomsky's work, and the presence of a natural order suggest some kind of access to UG in Krashen's model. If so, then the hypothesis-testing ability is constrained by UG, that is, it can only produce a grammar consistent with the principles and parameters of UG. In other words, there is a built-in grammar that develops subconsciously when triggered by the adequate type of input, thus giving rise to a certain order of acquisition. For that reason, ungrammatical hypotheses (in reference to UG) are not feasible.

Researchers do not agree whether UG is available to the adult second language learner. There are several positions taken by them. Some argue against the premise that UG is available to SL learners (Schachter 1990); some argue in favor of it (White 1990); some argue that there is evidence that SL learners have access to UG through their first language (Felix & Weigl 1991). In general, linguists' positions are similar to Krashen's: although they do not explicitly state it, some kind of access to UG is implied in their work.

One criticism made to the Monitor Model is related exactly to this point: because of more developed cognitive abilities, an adult can infringe upon the constraints of UG (Gregg 1984). In principle, the LAD corresponds to an initial stage of language acquisition in the child. In the adult, the LAD would not have this characteristic. Concerning this, Gregg (ibid:80) says:

> Not only is an adult not in an initial state with respect to language, but he also is endowed with a much richer set of cognitive structures, which theoretically at least could enable him to violate the constraints of UG.

As a matter of fact, the acquisition--learning hypothesis ignores some characteristics which are particular to adults, such as superior cognitive capacities, larger memory span, meta-awareness of language, and more developed pragmatic knowledge, and assumes they are equal to children in this respect, stating that adults still have access to the LAD and so are able to use the acquisition process. This point is contested mainly by those who take a psychological view of the learning process. They assume that language knowledge is processed in the brain like any other kind of knowledge, that it is a product of general intellectual capacity, not specialized knowledge, and that as such it is influenced by the characteristics mentioned above as proper to adults.

The non-interface hypothesis

A fundamental claim related to the acquisition--learning dichotomy is that learned knowledge cannot be transformed into acquired knowledge. This is known as the 'non interface hypothesis' (Krashen 1985:38). If acquisition is a process independent from learning, it does not benefit from conscious learning. In order to argue for this point, Krashen relies basically on observation of learners' reports. He cites examples of learners who are able to use complex structures in the second language and despite this, cannot explain the rules they use. The opposite is also true for him, that is, it is possible to find people who know the rules but are not able to use them correctly while actively using the SL. Finally, he also claims that SL learners or speakers use a lot more rules than they are able to describe, and this is true for very good learners or even for linguists. Such phenomena are part of the experience of every second language teacher, being, in this sense, extremely intuitive. Actually, this is what Krashen must have meant when he built his theory: 'to explain phenomena and provide *a sense of understanding*' (ibid:104).

However, the statement 'learned competence does not become acquired competence' (ibid:42), also implies something that is not so empathetic to SL teachers, namely, that conscious knowledge cannot become subconscious. The process of internalization or routinization of structures, still common in SL classrooms, does not produce SL competence, according to Krashen On that aspect, he holds a very daring and provoking position, once so many teaching methods, approaches and techniques have relied so heavily upon these concepts for so long.

An important consequence of the non-interface hypothesis is that learning serves only as a monitor, that is, an editor. Since it does not derive from the acquisition system, the monitor has a limited scope: it accounts only for those parts of the language for which the learner knows explicitly and consciously the rules. Besides, it is only available to the learner when s/he has time to monitor, and focuses on form, i.e., on the rules. Because the monitor works only as a source of editing or self-correction, it cannot start the production process (output). Only acquired knowledge serves for initiating utterances.

The conscious/subconscious issue

One of the most common criticisms made to the first hypothesis of the Monitor Model, the learning -- acquisition hypothesis, is that Krashen has never defined the terms conscious and subconscious precisely, and it seems that this lack of precision in the definition has caused most of the problems in Krashen's proposal and consequently in the theory itself. In fact, these terms can encompass several definitions, depending on the context/area they refer to. In the case of Krashen's model, if we consider the constructs that underlie the model, we will see that the concepts conscious and subconscious take us back to the Chomskyan notion of unconscious processes and knowledge, which are processes that are inaccessible in principle, that is, 'We can acquire knowledge

of their presence and activity by inference, but not by means of direct, immediate introspective awareness' (Chomsky 1980 cited in Bowers and Meichenbaum 1984:156). Such processes and knowledge are very clearly defined by Chomsky: it is 'knowledge which resides in the mental system, and is actively employed in the service of ongoing cognitive processing, but which is incapable of being brought into phenomenal awareness (physical consciousness) and placed under voluntary control. We know the contents of the mind only by inference, never through direct introspection' (ibid). On that basis, I object to Krashen's use of the word subconscious, which, according to traditional definition in psychology (Reber 1985:740), refers to information that is at the margins of awareness, but which can be made conscious, given the proper circumstances. This type of information is not the same as tacit knowledge (see glossary), which is actually what Chomsky is talking about (Chomsky 1975:164-6). Thus, it is wise to follow Reber as he adverts, subconscious 'should not, in any circumstance be used as a synonym for unconscious' (ibid).

Concerning the use of the terms *unconscious/subconscious* in this dissertation, I followed the terminology used by each author in their models. Whenever my opinion was at matter, the term *unconscious* was preferred.

Empirical evidence

The most severe criticisms evoked by the Monitor Model are related to the lack of empirical data to support the learning-acquisition distinction. McLaughlin (1978) states that the evidence for the two processes rests on the comparison between 'feel' and 'knowing the rule'. It is true that Krashen compares acquisition to an intuitive feeling of grammaticality about the language, and learning to consciously evoking the corresponding rule. On this issue, McLaughlin (ibid:317) states that 'it is impossible to know whether

subjects are actually operating on the basis of 'rule' or 'feel", above all because this is a subjective criterion. In a response to his criticism, Krashen agrees that 'we have no physiological measure that shows an acquisition-learning difference' (Krashen 1979:152) but he argues that like all research in Cognitive Psychology, in which an abstract hypothesis is made and then checked to see if it accounts for real-world phenomena, 'the acquisition-learning distinction is an abstraction that predicts many observable and concrete phenomena' (ibid). In this position, Krashen is supported by many important research leaders of the cognitive movement (Piatelli-Palmarini 1980).

Besides pointing out the lack of empirical evidence in Krashen's theory, McLaughlin (1978) also criticizes Krashen's evidence based on learner's introspection. According to him, they are not reliable, since they cannot be tested empirically. In my view, this should not be pointed out as a weak point in Krashen's theory, because Cognitivism makes room exactly for what Behaviorism refused to accept -- the existence of a mental life and the introspective reports that account for it.

The most serious criticisms to introspective data in Krashen's model seem to be due to another cause, raised by Seliger (1983). When Krashen says that subconscious knowledge cannot become conscious, then this involves (again) the Chomskyan notions of competence and performance. The internal system of language or the competence system is unconscious, and as such, is unreachable. Our performance reflects this system, but is not necessarily identical to it, because other variables are involved in performance. When we try to describe this internal system based on performance, we must be aware that we are describing an illustration of it, not the system itself. Because his theory is based on such theoretical tenets, Krashen could not, in principle, rely on introspective evidence to support his theory.

Seliger (1983) refers to SLA research that relies on introspective reports as 'the psychoanalytic school of SLA', in the sense that these retrospective reports on performance are to prove the learner's inner processes and his/her mental life. The main flaw of this line of research, according to Seliger, is that retrospective reports are taken as the product of competence or 'the acquired system', when, in fact, they are the product of performance. In other words, while they are elicited in order to show the process of language learning, in fact they show the product. This criticism makes sense, since competence in the Chomskyan sense (the sense being used here) is inaccessible through introspective awareness. For Seliger, once information is verbalized or brought to consciousness, it is already biased by interpretation and consequently different from what it was in the inner state.

In sum, Krashen proposes that two independent processes are involved in SLA: an subconscious one that leads to the formation of linguistic competence, based on internal innate capacities plus the provision of comprehensible input (or the focus of attention on communication rather than on linguistic forms); and a conscious one that serves as a monitor for self-correction, and that benefits from the formal teaching of rules. The fundamental claim of his model, known as the non-interface hypothesis, is that learning does not become acquisition, that is, the teaching of formal rules does not develop linguistic competence, it can only improve the monitor.

In the same way that Krashen's theory seems intuitively right to many teachers and researchers, it is not considered a scientific theory by many others that claim it lacks empirical/experimental support. However, recent views of what can be considered 'scientific' deny the need for 'positivist evidence' as a quest for science. In the light of such views, Krashen's theory would certainly be taken as an important contribution to the SLA field. This is specially true when we

consider his perceptions of the SLA process, which were forerunners of so many ideas, such as language specificity, unconscious knowledge, the non-interface hypothesis, relevance of meaningful input, and failure of the rote practice-based methodologies, that are .now widespread among SLA theories.

REFERENCES

Bley-Vroman, R. 1986. Hypothesis testing in second-language acquisition theory. *Language Learning* 36(3):353-75.

Bowers, K.S. & D. Meichenbaum (eds.) 1984. *The Unconscious Reconsidered*. New York:Wiley.

Chomsky, N. 1975. *Reflections on Language*. New York:Pantheon Books.

Felix, S. & W. Weigl. 1991. Universal grammar in the classroom: the effects of formal instruction on SLA. *Second Language Research* 7(2):162-81.

Gregg, K. 1984. Krashen's Monitor and Occam's Razor. *Applied Linguistics* 5(2):79-100.

Krashen, S. 1979. A response to McLaughlin, 'The monitor model: some methodological considerations'. *Language Learning* 29:151-67.

Krashen, S. 1985. *The Input Hypothesis: Issues and Implications*. New York: Longman.

Krashen, S., J. Butler, R. Birnbaum & J. Robertson. 1978. Two studies in language acquisition and language learning. *ITL: Review of Applied Linguistics* 39-40:73-92.

McLaughlin, B. 1978. The monitor model: some methodological considerations. *Language Learning* 28(2):309-32.

Piatelli-Palmarini, M. (ed.). 1980. *Language and Learning: The Debate between Jean Piaget and Noam Chomsky*. Cambridge, Massachusetts: Harvard University Press.

Reber, A. 1985. *The Penguin Dictionary of Psychology*. London:Penguin Books.

Schachter, J. 1990. On the issue of completeness in SLA. *Second Language Research* 6(2):93-124.

Seliger, H. 1983. The language learner as linguist: of metaphors and realities. *Applied Linguistics* 4(3):179-91.

Snow, C. In press. Bilingualism and second language acquisition. In J. Berko Gleason & N. Bernstein Ratner (eds.), *Psycholinguistics Today*. New York: Holt, Rinehart and Winston.

White, L. 1990. SLA and UG. *Studies in Second Language Acquisition* 12:121-34.

CHAPTER 4

THE TASK-BASED APPROACH

This chapter deals with Prabhu's task-based approach. Actually, it is a pedagogical approach to the teaching of a second language rather than a second language theory or model. However, the assumptions about learning that underlie this pedagogical approach constitute a significant contribution to the present study of acquisitional processes. Firstly in this chapter, some of Prabhu's assumptions about the acquisitional process, such as the system, the process, language awareness are presented. Such assumptions provide a better understanding of the classroom procedures, the second issue to be presented. Thirdly, an analysis is made of the cognitive underpinnings of the task, followed by some concluding remarks.

The system

Prabhu (1987:69), proposes that learners have an internal system of rules which is **activated** whenever the learner is exposed to meaningful input in the second language, or in other words, when the focus of the learning task is on content, on meaning, on communication.

This internal system is not equal to the one described by generative grammarians, nor is it equal to any tentative description that linguists make of what they consider to be the internal system: the internal system is much more complex than any descriptive grammar. It becomes clear in normal language use, when two levels of operation can be perceived: (1) a conscious one, where the language user conscious mind is busy with the message being communicated; and (2) an subconscious one, i.e., where his/her subconscious mind is simultaneously elaborating the message linguistically, in accordance with grammatical rules. The simultaneity of these two levels shows that the ability to elaborate the message linguistically does not develop directly and

consciously, but subconsciously, through focusing on meaning. This is the basic assumption of learning and teaching that underlies the task-based approach.

Halliday (1985) perceives the unconscious nature of spoken language and its non-correspondence with construed grammars. He affirms that:

> The sentence structure (of spoken language) is highly complex, reaching degrees of complexity that are rarely attained in writing. The categories of our language represent unconscious slices of meaning; that is why it is so difficult to build a grammatical theory, because when people talk their unconscious choice of the language does not correspond to our conscious structuring of sentences and use of words. (pp.XXIV -- XXVI; *parenthesis added*)

The task-based approach considers that the belief that the learner can acquire the internal system of a language by consciously understanding and assimilating the grammar rules which have been described by linguists is equivocal. What Prabhu claims is that linguists' grammars are **conceptual**, that is, they are not the language system per se but a probable picture of it, based on given outputs. In fact, outputs can provide just intuitions about the internal system; a picture of the system would be possible only if the system were isomorphic to available descriptions of it.

In this view of second language acquisition, 'planned progression' (Prabhu 1987:73), or the creation of a prospective syllabus based on language structures has no place, since language develops *in spite* of and not *because* of the teaching of structures. It seems that this view is in accord with the notion that language follows an independent route of development when triggered by meaning-focused tasks. This route consists of transitional systems, as posed by Corder (1967) in his interlanguage studies. Corder's claim is that as systems, the different stages of interlanguage are holistic and not itemized, as prospective structural syllabi suggest.

The process

The task-based approach is based on the view that the second language system develops through an subconscious process, namely, structure-abstraction. As defined by Prabhu (1987:69-70):

> Task-based teaching operates with the concept that, while the conscious mind is working out some of the meaning-content, a subconscious part of the mind perceives, abstracts or acquires (or re-creates, as a cognitive structure) some of the linguistic structuring embodied in those entities, as a step in the development of an internal system of rules.

Besides the concept of structure-abstraction, **deployment** is another concept of fundamental importance in Prabhu's view of language acquisition. It means that language abstracted while a task is being performed can be applied (used, transferred) to other contexts, being available for the purposes of production and understanding. Thus, it is said that linguistic competence achieved through the task-based approach is a **deployable linguistic competence**, because it is an ability that applies not only to immediate needs to express and understand meaning, but to the generation of language which is in accordance with grammatical norms.

In order for deployment in production to take place, it is believed, on the one hand, that abstract structures should be more firmly established than for comprehension. On the other hand, production serves to firm them up (ibid:70-1).

Language awareness

The important point about language awareness within meaning focused teaching is that it is not enhanced or initiated externally by the teacher, but it arises spontaneously and naturally as part of the process of acquisition of a deployable internal system. Prabhu believes that this awareness somehow facilitates the learning task (ibid:76), but he does not explain in what way it does so.

According to the author, awareness as a natural consequence of the development of the internal system differs from externally-induced awareness in two aspects: it arises at its own time; and it arises at its own place, that is, awareness may show at a certain stage of the learning process which is intrinsic and subconsciously determined by the learner's internal system. As such, it is entirely unpredictable. It may be the case that it emerges in each learner at a different time, and at a different stage of development, demonstrating individual variability. Thus, awareness induced by the teacher may not be very helpful if it does not overlap with the internal system's awareness of language. As posed by Prabhu (ibid:76):

> Attention to form which is externally initiated or manipulated is likely to remain unrelated to either process (i.e., of meaning-extraction or of structure-abstraction) and can only be a pedagogic objective in itself. (*parenthesis added*)

The natural emergence of this awareness is undeniable, but we cannot say that it is determined by the internal system. As will be argued in the next chapters, metalinguistic awareness is a characteristic of the general cognitive maturity present in the adult or young adult. The fact that it emerges spontaneously while acquisition is taking place does not mean that it is a result of the linguistic competence system being formed. Albeit emerging spontaneously, it is still conscious, and thus cannot be the product of the structure-abstraction process.

The pedagogy of the task-based approach

A task is defined as 'an activity which required learners to arrive at an outcome from given information through some process of thought and which allowed teachers to control and regulate that process' (ibid:24). According to the task-based approach, class activities should offer a cognitive challenge, that is, they should use cognitive processes such as reasoning, inferring, and inter-relating

information in a logical way, so as to provide the learner with a procedure in which s/he could focus entirely on meaning.

The class in the task-based pedagogy consists basically of three stages: the pre-task, the task, and the marking of the student's outcome of the task by the teacher. The pre-task is a whole-class activity guided by the teacher, which consists of a task that is solved by the teacher together with the class, in the form of interaction and negotiation. The teacher uses questions or instructions on the task in order to explain it. A task similar to this one is then given to the students in the 'task' part, for each one to solve it individually and in writing, the only interaction being between the learner and the task. In the third part of the class, the teacher gives feedback to the students, by marking their work not on language form, but on content. This part serves also as a guidance to the teacher in terms of the level of challenge that the task represents.

The cognitive counterpart

Prabhu compares subconscious abstraction of linguistic structures with the formation of cognitive structures. Cognitive structures can be inaccurate and incomplete at first, but with constant exposure to the target language, with constant effort to extract meaning from the same piece of language, which appears repeatedly during the three pedagogic stages, they are modified, thus becoming accurate, complete and firm.

Not only the abstraction of structures is possible through meaning-focused activities, but their 'elaboration' also benefits from it. Existing cognitive structures make it possible for new linguistic structures from new language samples to be understood and in this process the existing structures suffer an adjustment, that is, they may be firmed up, modified, extended, or integrated. In this way the internal system is developed, little by little.

This view of language acquisition resembles some notions developed by Ausubel (1978) in his view of acquisition of knowledge, the Assimilation

Theory. In fact, a parallel can be drawn between the theories. Like Prabhu, Ausubel establishes that there is a cognitive structure and there follows hierarchically anchoring ideas, which are part of the cognitive structure. The most important requisite to anchor a new idea is the availability of previous knowledge (anchoring ideas). Anchoring ideas also suffer a process of adjustment as they are exposed to new data. They may be enlarged, changed or integrated to new ideas. The notion of deployment can also be compared to a similar notion in Ausubel's theory, namely, the notion of **transferability** of newly learned material to the existing cognitive structure. Transfer, as defined by Ausubel (1978:166) refers to 'the impact of prior experience upon current learning'.

In spite of such similarities, Prabhu's concept of learning differs intrinsically from Ausubel's. Ausubel maintains that the cognitive structure is constructed, not activated, via interaction with the environment, in a very conscious manner, that may include practice as well. It relies principally on the environment rather than on the internal system. In fact, for Ausubel, there is no internal system to be triggered, what there is is an ability to acquire the language system. As we will see, this constitutes a fundamental difference between theories/models that rely on linguistic assumptions and those which rely on psychological ones.

The cognitive underpinnings of the task: problem-solving

The task-based approach can be said to use a cognitive-oriented procedure, the task. It is so because the task involves a cognitive device known as problem-solving. Problem-solving is defined by Ausubel as 'any activity in which both the cognitive representation of prior experience and the components of a current problem situation are reorganized in order to achieve a designated objective' (ibid:565). It involves sequentially two kinds of learning: reception and discovery learning.

A problem-solving task involves reception learning as it requires the understanding of the problem and the assimilation of the solution of the problem. In this part of problem-solving the content is presented to the learner, it does not have to be discovered by him/er. A problem-solving task involves discovery learning because hypotheses must be made up and tested using previous knowledge of the learner about the problem in order to find a solution to it. What is to be learned, that is, the content, must be discovered by the learner through hypothesis-testing.

Both reception and discovery learning can be meaningful, thus creating meaningful problem-solving, if four coditions are met: (1) the problem proposition is meaningful, (2) the problem proposition is relatable to the cognitive structure, i.e., if it has background knowledge to anchor on, (3) the problem proposition is logical, and (4) if it has the purpose of generating a meaningful solution.

It is important to observe that it is not the solution to the problem that develops language, but the interaction with language used to perform/solve the task. If the problem is meaningful, though, language will not be an end in itself, but a means to allow the learner engage in the steps involved in the problem-solving.

In sum, Prabhu proposes a view of second language learning that aims at developing grammatical competence through reasoning tasks. In fact, however, such tasks are to promote grammatical competence only indirectly: it is not that reasoning tasks are the triggering to the learning process -- they keep the learner engaged intensively on exposure and interaction with the target language and this intensive exposure and interaction with the target language promotes the development of grammatical competence. (Prabhu 1987:53) Reasoning tasks are, therefore, much more a *teaching device* than a *learning device*.

It seems to me that the view of the language learning process proposed by Prabhu is very much the same as that proposed by Krashen when he talks of *acquisition*. Their views hold the same assumptions, namely, that language develops subconsciously in the presence of and through interaction with meaningful input. Prabhu actually perceives this similarity between both perceptions, which emerged independently from each other. Such similarity reflects the convergence of the intuitions about second language research at the time the task-based approach was developed in India.

The means through which input is made meaningful and brings about interaction is the basic difference between both proposals. While for Krashen 'comprehensible input' is given to the students via communicative activities, which are not really explained by him, and which in turn generate interaction between teacher and learners or among learners, for Prabhu meaningful input is given through the tasks and interaction takes place between learner and task.

The influence of a linguistic theory becomes evident in Prabhu's proposal when he speaks of Chomskyan notions such as the competence system, the triggering of this system by input and the process of subconscious abstraction of rules. At the same time, the task-based approach unravels an essential condition for developing competence in a second language, that is not present in linguistic theories: the focus on meaning. As will be shown, it is precisely this condition that makes Prabhu's proposal so effective, and so intuitively right.

REFERENCES

Ausubel, D., J. Novak & H. Hanesian. 1978. *Educational Psychology: A Cognitive View*. New York:Holt, Rinehart and Winston.

Corder, S. 1967. The significance of learners' errors. *International Review of Applied Linguistics* V:161-9.

Halliday, M.A.K. 1985. *An Introduction to Functional Grammar*. London: Edward Arnold.

Prabhu, N. 1987. *Second Language Pedagogy*. Oxford:OUP.

CHAPTER 5

THE MULTIDIMENSIONAL MODEL

In this chapter, I present the Multidimensional Model, which is the model resulting from experimental research in SLA carried out at the University of Hamburg by the ZISA group (Zweitsprachenerwerb Italienischer und Spanischer Arbeiter), led by J. Meisel and M. Pienemann. In the first part of this section, I present the model itself, which comprehends basically two dimensions of the learning process, the developmental and the variational. In the second part, I discuss the constructs of the model, and finally I make some concluding remarks concerning the conscious/unconscious issue.

Pienemann developed research in order to analyze how German was acquired by Italian and Spanish immigrants as a Second Language. He found that SL learners of German seemed to follow the same sequence of acquisition as they acquired syntax and certain morphemes, so he and his colleagues conducted extensive research in order to discover this sequence (Pienemann 1984, 1989; Meisel, Clashen & Pienemann 1981). They found that this sequence was basically the same for natural and for formal second language acquisition. German word order rules, for instance, were acquired in the same order in natural acquisition of German as a SL as they were by learners who went through one year of instruction (Daniel 1983 cited in Pienemann 1989). According to those researchers, this was due to the fact that the structures involved are based on processing prerequisites, which operate independent of the learning setting, for they are internal mechanisms. Thus, one thing that characterizes Pienemann's model is that the internal mechanisms work in the same way in both natural and formal SL acquisition.

The model describes the second language acquisition process as multidimensional because it consists of two dimensions or two axes: a

developmental one and a variational one. The developmental dimension is related to developmental stages that the learner undergoes during the learning process. But within these developmental stages there is considerable variation due to socio-psychological differences among learners. These differences constitute the variational dimension.

The developmental dimension

Developmental stages refer to stages of processing of the linguistic features. Developmental features of language (syntax, for instance) require processing prerequisites in order to be learned and thus learning is not successful if these processing prerequisites are not present. Speech processing prerequisites are related to the reordering of underlying linguistic structures and they will be explained more thoroughly in the section **Theoretical constructs of Pienemann's model**. The natural order implies these prerequisites, so if the learner is taught according to this order, s/he will be learning according to her/his current level of processing. Consequently, teaching will be successful because it will produce learning. If however the learner is not yet 'ready' to learn these features of language, that is, does not have the processing requisites to learn them, teaching will be of no use. In sum, the developmental axis is invariant, because it is subject to processing constraints.

The **teachability hypothesis**, which is the heart of Pienemann's model, is exactly about the developmental dimension of second language acquisition. It says that,

> Teaching is ineffectual (i.e. impossible) since L2 acquisition can only be promoted when the learner is *ready* to acquire the given items in the natural context (Pienemann 1989:61).

An example of developmental features from studies of English as a SL follows (adapted from Pienemann & Johnston 1987 cited in Larsen-Freeman & Long 1991):

Developmental feature: third person singular *-s*

Third person singular *-s* is a stage X+3, because it requires ability to use string-internal movement (this refers to movement of elements inside the utterance, or rearrangement of the utterance order), which will be demonstrated below:

1) In stage X, the learner produces canonical SVO order
   Ex. *You are student?* (SVO?)
   I no like. (no+X)
   I like Sydney. (SVO)
2) In stage X+1, s/he moves elements to the front of the utterance. This does not disturb, however, the canonical SVO order
   Ex. *In Vietnam, I am teacher.* (adv-fronting)
   Do you have apartment? (Do-fronting)
   Why you no eat? (Wh-fronting)
3) In stage X+2, the canonical SVO order is disturbed by movement of string-internal elements to initial or final position. Grammatical knowledge is also required for identification of movable elements.
   Ex. *Have you job?* (yes/no inversion)
   I like to eat my friend house. (complementizer insertion)
   You can take your coat off. (particle separation)
4) In stage X+3, movement of elements happens which requires recognition that elements moved are members of certain grammatical categories. Third person singular *-s* is acquired.
   Ex. *She eats too much.* (third singular *-s*)
   Why did you go? (aux. past, with agreement)
   She does not know. (do third p., with agreement)
   I wrote it myself. (reflexive pronoun)
   He gave the money to the police. (dative to)

The variational dimension

The other dimension that describes the second language acquisition process is the variational, which, as mentioned above, is related to socio-psychological differences among learners. Of these differences, attitude and motivation seem to play the most important role. They determine what kind of transitional system certain groups of learners use during their learning process. For instance, on one hand, there are learners who are more

segregatively-oriented towards the target language, that is, they have less contact with native-speakers and do not have a very positive attitude towards the target culture. It was found that these learners tended to use the strategy of restrictive simplification (omission of grammatical items which are not communicatively relevant, but are obligatory in use; ex. *Julia happy; she eat sandwich*) when learning the SL. On the other hand, there are learners who are integratively-oriented, they have a positive attitude towards the target culture and have more contact with native-speakers. These learners tended to use elaborative simplification (insertion of grammatical items; ex. *he wented, theys go*). In sum, the socio-psychological profile of learners (i.e. segregative or integrative) determined the kind of strategy of simplification they used (restrictive or elaborative), showing that different learner groups use/produce different transitional systems. This shows us, in turn, that the SLA process is not linear in the sense of being simply a gradation of competences from zero to target competence, as it used to be described, but that it is multidimensional, showing variation within the dimensions.

An important aspect of the variational dimension that must be discussed is that because it is determined by socio-psychological factors rather than by processing factors, the variational features are not subject to learnability constraints. Hence, they can be taught independently of a natural order, because they do not require processing prerequisites. Once variational features can be produced by the learner, it is said that they can be taught, and their teaching will be effective. The insertion/omission of the copula is a good example of a variational feature. Some learners produce equative sentences (i.e. with the copula) correctly at early stages, while others omit the copula even at more advanced stages (for ex. *he good; Jane hungry*). The developmental stages do not affect the use of the copula, whereas instruction does. In his studies, Pienemann demonstrates that the frequency of the

omission of the copula decreased significantly after its teaching (Hyltenstam and Pienemann 1985). In sum, the acquisition of variational features is not constrained by the processing capacity.

Reviewing, Pienemann's work was triggered by the results of previous studies that show that interlanguage structures produced by learners who received formal instruction and structures produced by those who went through natural acquisition were quite similar. From his findings, Pienemann attempted to explain whether formal instruction plays a positive role in SL acquisition, and if so, in what context it produces better results. He concluded that the learner follows a set of developmental principles which apply to both formal and natural SL development. When these developmental principles are respected, i.e., when instruction is given to the learner according to his/her level of processing capacity and consequently according to the natural order, then it influences the acquisition process positively, in at least three ways: it speeds up the acquisition process, it improves the frequency of rule application, and it improves the context of application of rules. However, when the processing constraints are not observed, instruction is not only ineffective, but also detrimental: studies carried out by Pienemann (1989) show that when the learner has to learn a structure for which s/he is not ready, s/he starts using the strategy of avoidance of that structure, which is not helpful to the learning process; on the contrary, it inhibits the learner's production.

This does not mean that instruction should be left aside, however. Since variational features of acquisition are not constrained by instruction, teaching may serve to develop them in the learner, and for that reason, instruction must not be abandoned, in spite of the difficulties in establishing the teaching order.

The theoretical constructs of Pienemann's model

1) Concerning the acquisitional view

Pienemann's model is influenced by the work of Corder (1967) as far as the acquisitional process is concerned (Hyltenstam & Pienemann 1985:41-2).

Corder (1967), in his first studies on interlanguage, suggested that second language acquisition is the product of a process similar to first language acquisition, which follows a natural and predictable order. Some years later, Corder (1973 cited in Hyltenstam & Pienemann 1985:41-2) developed this view and proposed that if adults showed the same internal mechanisms to learn an SL as a child did for his/her L1, then it could be assumed that second language learners would also follow a predictable order in the acquisition of SL. This assumption implies that there are some processes or operations (Pienemann calls them strategies) within the learning process which are universal, independent of the learning context or of the source language. These processes determine the order in which structures are acquired, according to the level of processing complexity they require.

2) Concerning the processing strategies

Pienemann's attempts to explain the processing strategies are based on a model of sentence processing first proposed by Bever (1970), Fodor, Bever & Garret (1974), Bever & Townsend (1979), and Forster (1979) (all cited in Pienemann 1984:199) and then developed by the ZISA group.

The model basically relies on the view emerging from research on sentence comprehension and production, that processing capacity - in syntax - 'results from reorderings and restructurings of various levels of underlying linguistic units' (Clashen 1982 cited in Pienemann 1984:199). These reorderings and restructurings may evolve in two ways: 1) through an autonomous linguistic level of processing containing a grammatical processor which is task-specific,

that is, processes grammatical tasks only, and 2) through a problem-solving component (GPS - General Problem Solving) which is not task-specific. The strategies of the GPS require less processing capacity than grammatical operations, because they use direct access between underlying structure and surface forms, as if it were a shortcut. Thus, learners will first produce structures which conform to the strategies of the GPS. However, certain complex linguistic structures cannot be processed by the GPS strategies, because the GPS is not task-specific. So, they are processed by the grammatical processor, in the following sequence: those that require the lowest processing capacity will be acquired first. The general conclusion is that 'rules which require a high degree of processing capacity are acquired late' (ibid).

There is a hierarchy of processing complexity which derives from the number of strategies deployed when producing the structures and from memory-load involved in the grammatical operations.

To conclude this line of thought, I would say that the Teachability Hypothesis posits that the sequence of acquisition is constrained primarily by levels of processing capacity (i.e., the more time/difficulty a structure takes to be processed, the more complex it is), and only indirectly or consequently by linguistic complexity.

The theoretical constructs of his model imply the following assumptions:

1 In relation to the process through which a second language is developed, it can be said that in Pienemann's model that process is the result of 'the unconscious system of language processing' (Pienemann 1984:207). Also because it develops through a natural route, it resembles acquisition, in the Krashian sense. However, it seems that only developmental features undergo an acquisitional process.

2 When instruction is given to learners without respect for the Teachability Hypothesis, or the processing constraints, it produces a kind of knowledge which is similar to Krashen's *learned knowledge*, that is, it is not available in natural/fluent speech, it takes time to be evoked, and does not turn into acquired knowledge; or, as put by Pienemann (ibid:206),

> ...this learning cannot result in actual use of the structure in normal speech (inside or outside the classroom) since processing it is not possible on the basis of the procedures available to the learner at this point in the development.

3 Variational features seem not to be the product of the internal system nor of the acquisition process, since they depend on external factors to develop, such as teaching and degree of acculturation.

Pienemann's work provides evidence for universalist assertions -- he demonstrates that formal instruction has no effect whatsoever if it is based on a sequence different from the natural sequence, which remains the same independently of the native language or of the learning setting. Yet, his model is limited by the natural orders found, most of them related to morpheme acquisition.

With respect to the process of SLA, I see this model as a psycholinguistic model influenced by linguistics (the notion of UG, natural route, unconscious learning strategies) for I consider that the determining factors in acquisition are the internal ones; they prevail over input. However, his model is considered interactionist in SLA literature because it brings in both innate and environmental factors in order to explain second language acquisition. In fact, this is the great strength of the model -- it is able to explain how internal factors and socio-psychological factors interact in order to produce the linguistic features.

REFERENCES

Corder, S. 1967. The significance of learners' errors. *International Review of Applied Linguistics* V:161-9.

Hyltenstam, K. & M. Pienemann (eds.). 1985. *Modeling and Assessing SL Development*. Clevedom Avon: Multilingual Matters.

Larsen-Freeman, D. & M. Long. 1991. *An Introduction to Second Language Acquisition Research*. New York: Longman.

Meisel, J., H. Clahsen, and M. Pienemann. 1981. On determining developmental stages in natural SLA. *Studies in Second Language Acquisition* 3(2):109-35.

Pienemann, M. 1984. Psychological constraints on the teachability of languages. *Studies in Second Language Acquisition* 6(2):186-214.

Pienemann, M. 1989. Is language teachable? Psycholinguistic experiments and hypotheses. *Applied Linguistics* 10:52-79.

CHAPTER 6

SELIGER

In this section I intend to discuss Seliger's view on SLA: his conception of the acquisition process, which is consistent with neurolinguistic findings, and which involves basically two kinds of knowledge -- linguistic and metalinguistic; his particular perspective of verbal reports, and finally the validity of verbal reports to other areas of research in SLA.

Despite the fact that Seliger does not have a model, his perceptions constitute an important contribution to the explanation of SLA. He and Sharwood Smith (in his current view) are the (psycho)linguists who come closest to the neurolinguistic view. In spite of the Chomskyan influence in aspects such as the unconsciousness and the inaccessibility of the competence system, he seems to be able to distinguish theoretical/linguistic notions from notions that have psycho/neurological reality. This may be due to his involvement in neurolinguistic research.

The influence of neurolinguistic research on Seliger's view

In his 1978 article, 'Implications of a multiple critical period hypothesis for SLL', Seliger reviews neurolinguistic literature related to the subject of the critical period for adult acquisition of second languages. He concludes that there are multiple critical periods for the acquisition of a language in one's lifetime, due to various changes that take place in the brain as a result of maturation. This is known as the **completeness hypothesis** (ibid:11). These changes, namely, loss of plasticity, lateralization (the concentration of language functions in one hemisphere of the brain), and localization of different functions in the two hemispheres weaken/decrease language acquisition abilities gradually and successively. Seliger attributes this natural weakness

preponderantly to plasticity, however, until some years ago it was believed that lateralization was the predominant cause. This hypothesis is not accepted any longer by most neurolinguists.

According to Seliger, being a biological function, plasticity decreases with age, affecting different aspects of language at different stages. While there is plasticity in the brain, it is possible to acquire a second language just by being exposed to meaningful input, and this process produces propositional language in the learner, that is, language that is integrated into the linguistic system. Once plasticity is lost, it is not possible to acquire a language simply by being exposed to meaningful input. A different kind of learning takes place then, a type of classroom learning, which relies on practice rather than just on exposure to input. This kind of learning produces what has more recently been called declarative knowledge. It is not language per se but **language-like behavior**, in Chomsky's terms (Chomsky 1975 cited in Krashen 1985:102).

The acquisition of the phonological system of a language is the most typical example of this process (for reasons that are extensively discussed in Seliger 1978). The phonological system is acquirable up to puberty and never post-pubertally, because of the reduced plasticity in the area of the brain responsible for its acquisition.

A general tendency is to compensate for this natural weakness by stimulating right brain areas which have a similar (but not identical) ability. It is possible to get meaning out of written or spoken input as chunks, for instance, because this involves the synthetic ability of the right hemisphere, but it is not possible to make analysis of the input (i.e. to sort complex auditory parameters into phonetic features), using the right hemisphere, because this is a left-brain ability subject to decrease due to the loss of plasticity.

The same attempt to compensate for this natural weakness happens in the second language classroom, when a learner is having difficulty in acquiring a

language aspect that has under gone a 'critical period', as in the case of phonology. The general tendency of the teacher in that case is to emphasize form divorced from meaning, in a behaviorist-like practice, such as drilling or repeating. In fact, right-hemisphere functions -- memorization of chunks, in this case -- are being used to compensate for left-hemisphere deficits. However, this practice is nothing more than rote learning and it is not useful even for the second type of learning, namely, classroom learning, let alone propositional learning. This second type of learning, according to Seliger, does not turn into propositional learning (leaving aside the matter of rote learning), and when propositional learning in a certain area of language reaches its critical period, this cannot be overcome, it is simply not available anymore.

Seliger's view of the acquisition process

1) Linguistic knowledge

Seliger sees acquisition as an active process, in opposition to behaviorism, which views the learner as a passive receptor, in which the leaning material is not processed, changed or recoded: input equals output. In Seliger's (1979:366) view, however, the learner reconstructs an internal model , using induction, deduction, and hypothesis-testing. Induction, it seems, plays a major role in the process of learning: 'Learning depends on the inductive abilities of the learner' (ibid:368). Language input is decoded and recoded before it is assimilated into the learner's cognitive structure. There is no chance of the learning material being assimilated without being recoded first, and this decoding depends very much on the learner's perception of it. Thus, information is perceived and stored by every learner in a different way. When Seliger talks of 'perceiving' the learning material he is not implying any level of consciousness, on the contrary, I would say that 'perceiving' is a very unconscious process in Seliger's view. This process leads to the formation of an individual system of unconscious

rules inaccessible through introspection. Some part of the input, however, may not be immediately assimilated, because the learner may not be cognitively ready for it. This notion reports us back to Pienemmann's notion of 'cognitive prerequisites', where the teaching of formal rules is not as efficient if the cognitive prerequisites for a certain structure are not there.

One important feature of Seliger's view is that he maintains that there is no direct access to the internal grammar. One can only know about it indirectly through performance, through expressed behavior, he claims. In the neurolinguistic section we will see that this claim does have neurological reality: we do have an implicit competence to acquire the linguistic system, but we have no direct access to it (see chapter on neurolinguistics). We can infer that a grammar is being formed by the external behavior that is observed. The form of this grammar, however, is unknown because it is inaccessible. So, what we have are different theories (Generative, Connectionist) created by linguists that try to describe this grammar. The grammar produced by them is a conscious, theoretical one.

2) Metalinguistic knowledge

Besides linguistic knowledge, there is another type of knowledge which does not result from the acquisition process, and that is metalinguistic knowledge. It consists of metalanguage, or knowledge about the language, and it is perfectly verbalizable. Conscious rules explicitly taught are stored in the form of metalinguistic knowledge. As posed by Seliger (1979:366), this is the monitor, in the very sense that Krashen uses this word . Also, this is the type of knowledge educed when introspections are performed.

Verbal reports in Seliger's view

Seliger has a very strong position in relation to the use of introspective methods in SLA. As a result of his beliefs in a linguistic competence which is unconscious and thus inaccessible, he criticizes research that uses introspections as evidence for linguistic competence or for linguistic processing. He refers to that as the 'psychoanalytic school of SLA', which is an orientation of recent studies in SLA which rely on verbal reports of learners. This orientation is so called because it takes learner's reports as 'evidence for the inner workings of the learner's mind' (Seliger 1983:185). Other psycholinguists and second language researchers interested in language processing (as Deese, for instance, cited in Dechert 1987) also share this position concerning verbal reports.

In this context, it seems that Seliger's (ibid:183) definition of introspection is justified: introspections are 'conscious verbalizations of what we think we know' . In his view, they serve to show how learners use acquired knowledge, and not how they acquired that knowledge (Seliger cited in Cohen 1987:88). That is, they reveal strategies used by learners, which he calls *tactics* and which, according to him, are potentially conscious.

According to Seliger (1983:188), the main reasons why verbal reports are not evidences of internal processes are the following:

1 According to psychological literature, conscious operations do not reach unconscious operations -- they belong to different, separate paradigms. While conscious operations are controlled and demand intentional awareness, unconscious operations are automatic, not reaching the level of awareness, and thus cannot be verbalized;

2 In order to obtain reports, learners have to attend to their own output, a task generally known as monitoring, and which overloads the memory system, hampering production;

3 Research on memory shows that the learner may be aware of much of his/her processing, but only while it is stored in short-term memory, that is, during some seconds. After that, information stored in short-term memory is encoded in a different form from that in which it was received, and the previous form is discarded. This is the time necessary for comprehension of meaning to take place. Hence, the linguistic processing that takes place while attention is available is not related to what is verbalized afterwards. They are two separate things.

4 The learner is not skilled or equipped to describe his procedural competence (even if s/he had access to it). That is the task of a researcher (linguist, psychologist) who is familiar with abstractions, linguistic rules, strategies. As a consequence, nothing can assure the researcher that the learner is describing the process used to acquire/produce a linguistic structure. S/He might well being guessing, creating, or inferring based on her/his output.

5 The same holds for interpreting learner's verbalizations: while these are the product of the interlanguage system of the learner, the point of reference of the researcher when interpreting these verbalizations (his/her intuitions used to interpret them) is his/her system. The result is an analysis of the learner's reports from the linguist's point-of-view. It is as if two language items were being compared without reference to the linguistic contexts from which they were extracted.

Verbal reports and other areas

Not all researchers in the field of second language hold the same position as Seliger concerning the validity of introspective data to explain current questions of research such as how a language is acquired or processed. Dechert (1987) is one in favor of such use, thus opposing Seliger. He makes an important

clarification about this matter (ibid): psycholinguists interested in first and second language processing do not recognize the psychological validity of introspective reports, while cognitive scientists do. Because of their diverse acceptance by researchers in the field, introspective data are used differently in the areas of cognitive science and language processing: in the first case, verbal reports are taken to shed light on mental processes that happen during the performance of a cognitive task, be the task verbal or not. They are seen as data to characterize cognitive stages that lead to the solution of a problem. The focus is on *what* is reported, and not on *how* it is reported. In the second case, language processing research, verbal reports are taken as revelations about the verbalization process. Here, the *how* is the focus, and not the *what*. This can be better visualized in the sketch below:

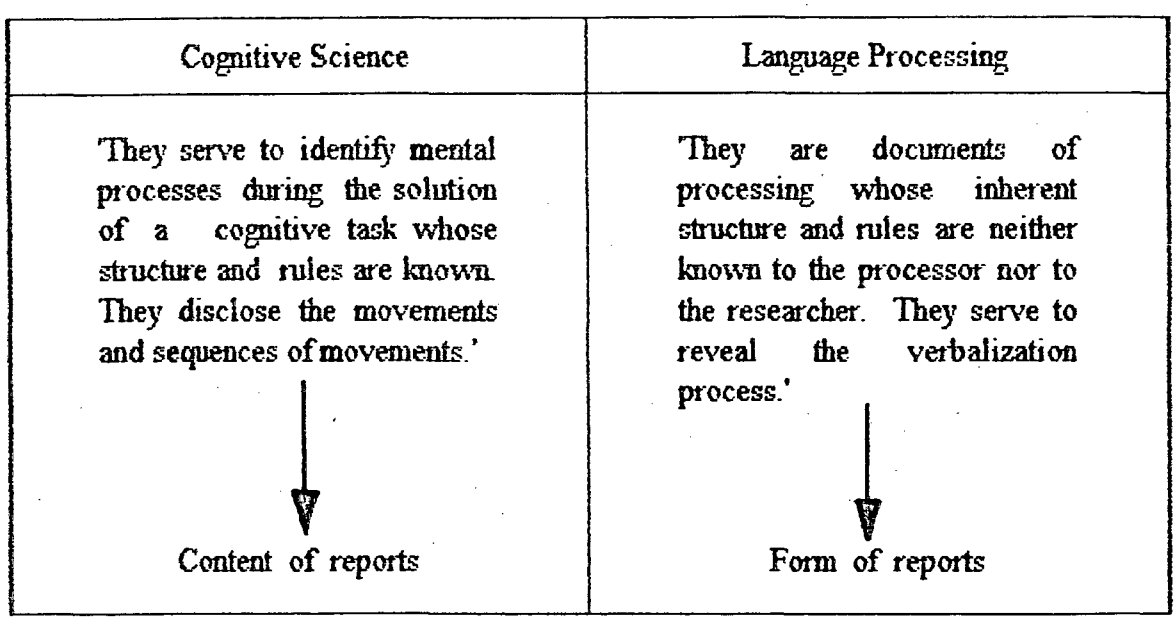


Fig.1 How verbal reports are used in Cognitive Science and in Language Processing research (based on Dechert 1987:88)

The fundamental thinking that underlies the role of introspective reports in Cognitive Science is that the human information-processing system is unified, that is, the processing of linguistic tasks is the same as the processing of non-linguistic tasks; both use the same mental processes. That is the reason why

cognitive scientists advocate the psychological validity of verbal reports, and it might also be the reason why psycholinguists resist accepting this validity. Seeing language as an independent module of cognition, they assume that it is acquired, stored and processed differently from other kinds of abilities.

Besides Dechert, Cohen (1987:88) is also favorable to the use of introspective reports in SLA, stating that mentalistic studies in the field of SLA prove more and more the validity of introspective reports in this field, although some linguists, especially Seliger, still object.

In contesting the objections of psycholinguists in relation to verbal reports, Dechert (1987:97) argues that introspective reports can reveal at least three types of information: information that is stored in short-term memory, in the focus of attention; information that is not attended to when stored in short-term memory, but that through activation and reorganization becomes accessible and verbalizable; and declarative knowledge, which, different from procedural knowledge, is accessible for verbalization.

The issue of introspective reports is extremely important in SLA research, specially when we consider that underlying it are the notions of competence and performance, which are, in turn, associated to the consciousness issue. Questions are raised in this discussion, such as: Are introspective reports the result of competence or performance? How can they be the result of competence if they are conscious, while the competence system is unconscious and inaccessible? Why, then are performative reports taken to mirror competence? Is there really a competence system, unconscious, as Chomsky said?

Seliger offers us answers to these questions. He says, 'Obviously, it is at the unconscious level that language learning takes place' (1983:187). Thus, conscious introspective reports cannot explain how this learning takes place. This

might be a daring position considering the present 'psychoanalytic school' that pervades SLA, but it is also a position consistent with its Chomskyan influence and, what is more, with neurolinguistic findings (at least with those presented in this dissertation). It shows clearly that both views cannot stand together -- introspection and neurolinguistics. Perhaps that is why neurolinguistics relies so heavily on observations rather than on introspections. Seliger's position also shows that introspection is not congruent with Chomskyan notions such as competence. But, above all, it makes remarkably clear that such Chomskyan notions are congruent with neurolinguistic findings.

REFERENCES

Cohen, A. 1987. Using verbal reports in research on language learning. In C. Faerch and G. Kasper (eds.).

Dechert, H. W. 1987. Analyzing language processing through verbal protocols. In C. Faerch and G. Kasper (eds.).

Faerch, C. and G. Kasper (eds.). 1987. *Introspection in Second Language Research*. Clevedon:Multilingual Matters.

Krashen, S. 1985. *The Input Hypothesis: Issues and Implications*. New York: Longman.

Seliger, H. 1978. Implications of a multiple critical period hypothesis for second language learning. In W. Ritchie (ed.). *Second Language Acquisition Research*. New York: Academic Press. 11-9.

Seliger, H. 1979. On the nature and function of language rules in language teaching. *TESOL Quarterly* 13(3), 359-69.

Seliger, H. 1983. The language learner as linguist: of metaphors and realities. *Applied Linguistics* 4(3), 179-91.

CHAPTER 7

SHARWOOD SMITH

Sharwood Smith's model, influenced by Linguistics and by the work of Chomsky, holds that language learning (at least a part of it) is developed in a language-specific mode, which is still available to the adult learner. Actually, his view consists of two phases, an early one which was a reaction to the new methodologies based on the 'creative construction approach', and a recent one, influenced by the work of Fodor (1983) on modularity. In this recent work, he improves on what was previously considered a hypothesis into a self-contained proposal of bilingual processing.

EARLY VIEW

Linguistics and language pedagogy

As stated above, the early work of Sharwood Smith (Rutherford & Sharwood Smith 1985; Bialystok & Sharwood Smith 1985; Sharwood Smith 1986) was a reaction to the new methodologies that arose after the era of Modern Linguistics, from 1954 onwards, as for instance the natural approach of Krashen & Terrell (1983). These new methodologies were based on the view that an environment similar to that of first language acquisition was the best one for the development of a second language. This view was influenced by the creative constructionists (Dulay, Burt & Krashen 1982), who, according to Sharwood Smith (1986:239), believed that Theoretical Linguistics had very little to offer to language pedagogy. In other words, the use of knowledge about the language would not contribute to the learning of that language. Several important names of the Applied Linguistics field, such as Widdowson, Brumfit and Johnson (cited in Bialystok & Sharwood Smith 1985) reiterated such a belief, underestimating the goal of Theoretical Linguistics. Theoretical Linguistics is not merely the

description of language structure, as posed by the linguists, and thus useless to language pedagogy, but indeed its goal is 'an understanding of the workings of the mind' and in this way it can be considered as revealing to the learning process as Cognitive Psychology, or perhaps a branch of it, as claimed by Chomsky (1972:28,88). The outcome of Linguistic research is a description, but by no means the description of language structure (Generative grammar, for instance) can be considered an end in itself. In fact, the theoretical nature of Linguistics can be attributed to its ultimate goal: the development of theories to explain abstract phenomena of the mind, as constructs and processes.

Sharwood Smith's view is a reaction against the thinking that brought about the new methodologies, the thinking that Linguistics is of no help to language pedagogy. He claims that teaching formal properties of the language (i.e., raising awareness of the language in the learner) might be useful, at least in certain moments of the learning process.

The acquisition process

According to the early view of Sharwood Smith, two processes take place in the mind as it is stimulated by input: **comprehension** and **acquisition**. Comprehension is defined as 'the decoding of particular messages which have been encoded in linguistic form' and acquisition as 'the creation of new mental structures which we call grammatical competence' (Sharwood Smith 1986:239). This means that input has *dual relevance*, that is, while it is being attended to for its meaning, or processed for comprehension, as the author says, structures present in the input that are relevant to the learner's competence at the moment (at the 'i+1' level, in Krashen's terms; 'optimum or learnable input', in Pienemann's terms) are being acquired, abstracted, or processed for acquisition, in his terms. Other structures will be acquisitionally irrelevant at this moment, for the learner may not be 'ready' for them, in Pienemann's sense.

The formation of L2 competence triggered by input is essentially a creative process, free from L1 transfer, in the sense that this process is not a 'copy' of the first language competence system, but it is a creation of an entirely new system. In Krashen's words, it is the *acquisition process*. This process of L2 formation is similar to that of first language acquisition, but it depends on additional resources (as for instance, the metalinguistic ability) which will be discussed later. These processes are involved in the formation of a transitory system known as 'interlanguage'. According to the author, this system has a bi-dimensional facet: it is composed of *knowledge representation and control* (Bialystok & Sharwood Smith 1985:104,5). Bialystok & Sharwood Smith are not clear as to whether there is only one process responsible for the creation of the competence system and for controlling/accessing it in language use. Nor are they clear as to how the acquisition process accounts for its twofold function. What is clear is that the general process responsible for the construction of interlanguage has a twofold function: creating mental representations of the target language, and developing procedures for accessing these mental representations.

The claim that the SLA process is the same as the first language process is based on analysis of the interlanguage data of learners of second languages. The interlanguage data produced was so similar to the first language data that there was no need to suppose that other processes were involved beyond the ones proposed by the authors.

Figure 1 aims at clarifying this bi-dimensional facet involved in interlanguage.

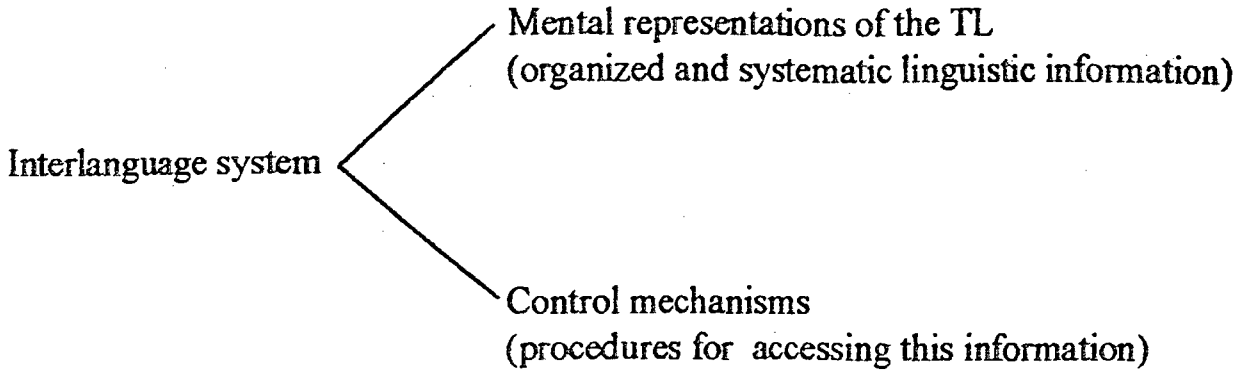


Fig.1 Sharwood Smith's view of the interlanguage system

We may infer that the acquisition process implies analysis (see glossary), because the author says that knowledge of the TL is developed to the extent that analysis and reanalysis are done. An increase in analysis means an increase in competence. Analysis turns chunks of knowledge abstracted by the learner into creative language, that is, into structures that can be used independently, applied to new contexts. Besides, analysis also discloses the organizing principles of the language.

It is important to note that, in this view, analysis is not linked to the development of metalinguistic awareness, necessarily: 'increasing analysis does not imply an increase in conscious awareness of structure on the part of the learner' (Bialystok & Sharwood Smith 1985:107), which means that the analysis task is possibly accomplished subconsciously.

Metalinguistic awareness

Metalinguistic awareness is a key-word in the view of Sharwood Smith, and is a topic quite relevant for my discussion of the (un)consciousness of SLA, which justifies the presence of his work in this study. Since the early phase of his work, the author has been overtly intrigued by the role of metalinguistic awareness in SLA, brought about by **consciousness-raising** (C-R from now on). The notion of C-R in that phase takes a common meaning in the area: 'the

deliberate attempt to draw the learner's attention specifically to the formal properties of the target language' (Rutherford & Sharwood Smith 1985:274). In the second phase, we will see that it becomes a much more technical notion, whose meaning is more complex -- and more precise. Thus, he is going to make a difference between 'sporadic insights into aspects of language' that even children have available at an early age, and which he calls *metalinguistic awareness*, and 'the more elaborate (encyclopedic) knowledge about the formal properties of the language gained during formal education', called *metalinguistic knowledge* (Sharwood Smith 1991:20-1). Here, the focus is on the notion used in the first phase, which will be extensively discussed below.

Consciousness-raising

The particular view of C-R held by Sharwood Smith in the first phase of his work gave rise to a hypothesis known as the Pedagogical Grammar Hypothesis (Rutherford & Sharwood Smith 1985:277).

Consciousness-raising may be described as having *degrees of elaboration*, that is, the teaching of a grammatical feature can be explicit (as in the case of a given rule) or implicit (exposing the learner to crucial, pre-programmed data, and letting him induce the rules). Another option would be not to stress nor suppress any grammatical feature, but just to ignore them. In any case, the fact is that the choice between the degrees of elaboration, or even of not choosing a degree at all, is usually made by the teacher on the basis of his/her intuitions of what is simpler to learn and what is more complex. Sharwood Smith states that the decisions on complexity or simplicity must be principled, not random, and principled on the basis of a constant factor. He proposes that **aspects of Universal Grammar** be that constant factor. This proposal lead to the Pedagogical Grammar Hypothesis, which does not aim at being a model, as he

says, but rather a hypothesis on how to teach certain linguistic structures in terms of C-R, and whether to teach them at all.

The Pedagogical Grammar Hypothesis (PGH from now on) states that explicit teaching of linguistic aspects can facilitate and even accelerate the process of acquisition (when compared to natural acquisition) if given under certain conditions, while the absence of explicit teaching where/when needed may slow down the process. As said before, the 'conditions' referred to here are related to principles and parameters of UG. Now, what exactly does that mean?

The PGH is based on certain assumptions derived from modern Generative theory. One of these assumptions is that the second language learner is endowed with certain principles of Universal Grammar (see glossary). Such principles are thought to be available for the second language learner and the author enumerates research that demonstrates this (ibid:277).

Another assumption that underlies the PGH is that UG principles are constant for all language learners. His point is that those principles do not need to undergo any degree of C-R, that is, they should not be given (implicitly or explicitly) attention in the PG. On the other hand, aspects that vary among languages, the parameters, must be considered in the PG -- they deserve some degree of elaboration of C-R. The parameters constitute aspects of difficulty for SL learners, and the degree of elaboration of C-R used for each parameter will depend on the difficulties posed by these aspects in each language. For instance, the notion that the sentence obeys a certain order, as well as the notion of canonical order, is a UG principle, which does not have to be taught, according to the PGH. However, the notion of dropping the subject (PRO-drop) is an aspect specific to the language being learned, that is, a parameter, and as such it must be taught. Now, whether its teaching will be explicit or implicit, this will depend on the language. In English, as well as in French, dropping the subject or object

is not allowed, while in Portuguese it is. Such a rule can be learned more rapidly if taught than if it remains to be acquired spontaneously via positive evidence.

But whatever the degree of elaboration used, implicit or explicit, the fact is that it is his claim that the use of degrees of C-R in the teaching of these aspects will accelerate their acquisition. In sum, C-R is considered 'a potential facilitator for the acquisition of linguistic competence', although not the only one (ibid:280).

Input enhancement

In his 1993 paper, Sharwood Smith presents the term *input enhancement* as a substitute for the former term *consciousness-raising* (Rutherford & Sharwood Smith 1985). This change in terminology was due to the former word implying a certain state of mind of the learner, from unconscious or subconscious to conscious, which suggests that all *input* becomes *intake*, and which is not true at all. The fact that the teacher (or available input) raises consciousness in the learner about a certain aspect or structure of the language does not mean that the learner acquired that structure, that it became intake. Unfortunately, research in SLA has not yet reached the point of specifying under which conditions a certain aspect of the input becomes acquired (intake). What we know, and which is relatively unanimous in SLA research presently, is that input must be relevant and meaningful in order to trigger any acquisition. This is exactly the meaning of input enhancement here: input might be manipulated so that it becomes more or less appropriate to acquisition, more or less relevant. But whether this manipulated input will reach its aims is another issue that might deserve a much more extensive discussion than is appropriate here.

RECENT VIEW: Language processing

Sharwood Smith's (1991) recent view is largely influenced by the modularity thesis, in particular by the works of Fodor (1983) and Jackendoff (1987). Following his earlier view that linguistic processing has two dimensions, knowledge representation and knowledge control (Fig. 1), he now elaborates on that same view, reaching a satisfactory answer at least for how one of the two dimensions -- the knowledge representation dimension -- is structured in the mind. The answer lies in the modularity thesis and it seems to be successful, since his proposal brings him to the same conclusions as those of the neurolinguistic view, whose merits lie in having been developed solely from observable data.

Note that Sharwood Smith uses the expression *language processing* in his recent phase to refer both to the build up of knowledge representation and the on-line control of this knowledge. For this dissertation, only the knowledge representation dimension is relevant, because it is this one that deals with the acquisition of grammatical competence and the processes involved in it. Thus, following him, I will call that dimension of his model language processing, although this use differs from the general use I adopted in this dissertation.

The knowledge control dimension will be left aside for not being pertinent to this study. Besides, as just mentioned, while the author reaches a satisfactory solution for the knowledge representation dimension, namely, the modularity, the same assurance does not hold for the knowledge control dimension, which is still speculative.

According to Fodor (ibid), knowledge in general (including linguistic knowledge) is compartmentalized in modules in the human mind, which are self-contained, encapsulated, independent of each other but somehow related to each other. The linguistic module is internally divided according to the divisions

of the mental grammar proposed by Chomsky. Not only the internal modules of the linguistic module emanate from Chomsky, but if we reconsider the notions of implicit and explicit knowledge, we will see that implicit knowledge has its roots in the Chomskyan notion of linguistic competence -- knowledge that is subconscious and inaccessible to introspection. Now, explicit knowledge seems to be out of the scope of linguistic competence -- in fact, it refers to metalinguistic competence, a subject that has not been overtly discussed by Chomsky, but yet this covertness might be meaningful: metalinguistic awareness cannot be part of linguistic competence, since it is not subconscious knowledge. In any case, going back to Chomsky brings a better understanding to Fodor's ideas and consequently to the work of Sharwood Smith.

The central idea of a modular mental processor is that linguistic knowledge is not only a separate module from other kinds of knowledge (see Fig.2A and 2B), but is also acquired in a different way and retrieved in a different way.

Like other input systems (visual, auditory, and so on), the linguistic system works in a reflexive, automatic way: that is, whenever these systems are triggered by input (external stimulus), they have a mandatory, automatic reaction, a reflex. Thus, we cannot avoid understanding a linguistic message when we are exposed to it: comprehension is automatic, reflexive. In other words, the *use* of the linguistic system is automatic, but *use* will not be discussed further here.

The acquisition of the linguistic system or mental grammar is a process specific to language: that is, it does not follow general cognitive development. This process is constrained by universal principles known as Universal Grammar. The principles are biologically inherited or inborn. Because this process is essentially a creative one, the learner comes to know much more about the linguistic system than what is taught to him/her, and notably in the

absence of negative evidence. The child has little or no negative evidence at her/his disposal. As for the adult, it could be argued that the negative evidence provided by teaching is assystematic, inconstant and fragmentary, assuming that adults make use of the same process of acquisition as the child. However, this is only partially true. The adult has available an important resource for learning a second language, namely, metalinguistic knowledge, and that makes all the difference. Most aspects of the second language are acquired consciously, and thus belong to another type of knowledge, known as encyclopedic knowledge, which is processed differently from linguistic knowledge. Pragmatics, lexico-semantics and parts of morphology are encyclopedic knowledge, requiring consciousness to be processed. However, this does not hold for phonology, syntax and some aspects of morphology. They are processed within the linguistic module. As for syntax, studies have shown that negative evidence is not only unnecessary but also useless to its development in the adult second language learner (Sharwood Smith 1991:13; Pienemann [see respective chapter]).

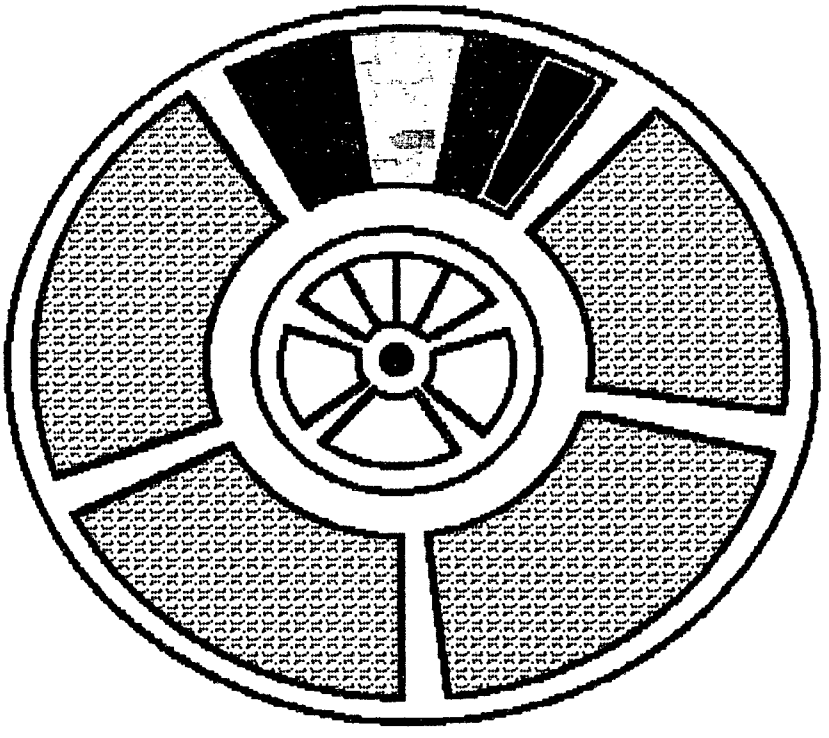
Still an important point about the development of linguistic knowledge is that it does not improve with cognitive maturation. It reaches its climax at puberty, and from then on the ability to acquire the different aspects of language suffers a successive and constant decrease. This is known as 'the multiple critical period hypothesis' and is discussed at length in the chapter on Seliger .

Encyclopedic knowledge is defined as 'our knowledge of history and physics, as well as our idiosyncratic knowledge of events, people and places' (Sharwood Smith 1991:11). By his definition, it seems that Sharwood Smith uses the term *encycopedic knowledge* as a cover term for both encyclopedic (conceptual knowledge) and episodic knowledge (knowledge of events). This cover term should actually be *declarative knowledge*, as we will see in the neurolinguistic chapter.

Encyclopedic knowledge is processed within what Fodor calls the 'central processor', which is a module responsible for general cognitive development. It is acquired consciously and it is subject to scrutinity, analysis, conscious manipulation, reflection. The acquisition of this type of knowledge involves induction, which is an ability that improves with cognitive maturation. It has some degree of similarity with Ausubel's discovery learning.

The use of encyclopedic knowledge is at first slow and laborious (some authors call this first stage of use *controlled use*), but once practice and corrective feedback are supplied, it becomes rapid and *automatic*. This is further developed by Sharwood Smith when he talks of the knowledge control dimension (Sharwood Smith 1991:14).

Metalinguistic knowledge is referred to by Sharwood Smith, in his recent phase as 'explicit knowledge about language that is freely accessible to introspection' (ibid:1991:13). His view of metalinguistic knowledge is of uppermost importance to this study, such is its similarity with the neurolinguistic view. He claims that, because metalinguistic knowledge involves conscious manipulation of knowledge, it approaches much more encyclopedic knowledge than linguistic knowledge, although it is certainly part of what we call LANGUAGE. Thus, metalinguistic knowledge is not acquired like linguistic knowledge (into the SUB-META or DEFAULT mode of processing, as it is known [ibid:1993:171]), but follows the acquisition of encyclopedic knowledge, this mode of processing being known as the META-MODE (ibid). For that reason, that is, because they are two different kinds of knowledge, metalinguistic knowledge does not interfere in fluency, which depends solely on linguistic knowledge. Similarly to encyclopedic knowledge, metalinguistic knowledge improves to the extent that inductive learning improves, with cognitive maturation.



LINGUISTIC MODULE

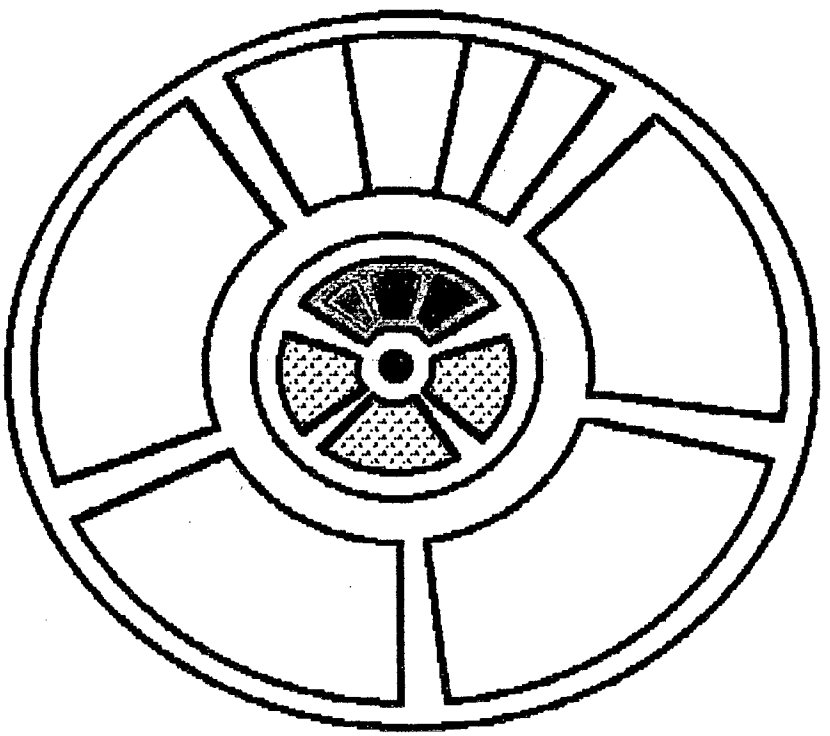
- Syntax
- Phonology
- Morphology
- Lexico-semantics

OTHER MODULES

- Auditory
- Visual
- Olfatory
- Gustatory

Fig. 2 - B Sharwood Smith's bilingual modular mental processing model (based on Fodor 1983)

Linguistic Module



CENTRAL PROCESSOR
(general cognitive development)

Lexico-semantics

Morphology

Pragmatics

Meta-mode

Other knowledge: history, math, world knowledge

Fig. 2 - A Sharwood Smith's bilingual modular mental processing model (based on Fodor 1983)
Central Processor

In brief, linguistic knowledge, in the common sense of the word, consists of two kinds of knowledge radically different from each other. They differ in nature (i.e., source), and on the way they are acquired. They also differ on how they are retrieved, but this is beyond the topic in question.

Summing up Sharwood Smith's view of SLA, we can say that the first phase of this view tells us that input has a twofold aspect: looking for meaning and looking for form. This insight reveals two kinds of processing of linguistic input: acquisition and comprehension. While the focus of attention of the learner is on meaning, form is being abstracted subconsciously. Meaningful natural input is a necessary condition for SLA, but teaching may help if given at the right phase of the learning process. In sum, being exposed to meaningful input produces L2, but the process might be more effective if teaching is considered.

Another process proposed in his early view is analysis, a subconscious process that produces competence in the TL. In Sharwood Smith's view, analysis has a preponderant role in SLA. We may infer that analysis is part of the acquisition process, in Krashen's sense. He also agrees with Krashen in that the 'conscious type of learning' does not help produce **acquired knowledge** or 'spontaneous control of first or second languages' (Rutherford & Sharwood Smith 1985:274). Thus, Sharwood Smith's ideas of the acquisition process can be said to be compatible with Krashen's in their fundamental assumptions.

Still in his early phase, Sharwood Smith holds that instruction or C-R, as he calls it, may help to accelerate the acquisition process, if given under certain conditions, which are linked to Universal Grammar's principles and parameters. Universal Grammar is not to be considered the only efficient and/or sufficient factor to determine the degree of C-R necessary, however, it is an important constant factor to be considered.

The second phase of Sharwood Smith's work tells us quite detailedly and factually how acquired and learned knowledge, in Krashen's sense, are represented in the learner's mind. It also tells us that metalinguistic knowledge does not lead to linguistic competence, since both do not emerge from the same source of knowledge.

It is interesting to observe how his view, emerging from theoretical linguistics, when influenced by recent work in psycholinguistics, reaches the point of being such a realistic proposal, that can be put side by side with the neurolinguistic view, without denying its linguistic bases. The constraints posed by UG, for instance, are present in the first view as a theoretical construct, but in the second, they become psychological entities, part of the innate ability/predisposition to acquire a language; similarly, language-specificity, a Chomskyan claim incorporated by Sharwood Smith, is part of both views, certainly giving rise to the concept of 'modularity'; but above all, the unconsciousness of the linguistic competence and of the processes that form it, an issue so much disputed, gains strength in this theory, reaching a psycholinguistic status.

There is only one explanation for that: there must be much truth about the acquisition process in theoretical linguistics.

REFERENCES

Bialystok, E. & M. Sharwood Smith. 1985. Interlanguage is not a state of mind: An evaluation of the construct for second-language acquisition. *Applied Linguistics* 6(2):101-17.

Chomsky, N. 1972. *Language and Mind*. Enlarged edition. New York:Harcourt Brace Jovanovich. 1st. ed. 1968.

Dulay, H., M. Burt, & S. Krashen. 1982. *Language Two*. New York:OUP.

Fodor, J. 1983. *The Modularity of Mind*. Cambridge, MA:MIT Press.

Jackendoff, R. 1987. *Consciousness and the Computational Mind*. New York:Academic Press.

Krashen, S. & T. Terrell. 1983. *The Natural Approach: Language Acquisition in the Classroom*. Oxford:Pergamon.

Rutherford, W. E. & M. Sharwood Smith. 1985. Consciousness-raising and Universal Grammar. *Applied Linguistics* 6:274-82.

Sharwood Smith, M. 1986. Comprehension versus acquisition: Two ways of processing input. *Applied Linguistics* 7(3):239-56.

Sharwood Smith, M. 1991. Language modules and bilingual processing. In E. Bialystok (ed.). *Language Processing in Bilingual Children*. Cambridge:CUP.

Sharwood Smith, M. 1993. Input enhancement in instructed SLA. Theoretical Bases. *Studies in Second Language Acquisition* 15:165-79.

CHAPTER 8

INFORMATION-PROCESSING THEORY

The clearest application of cognitive theory to second language acquisition is found in the work of McLaughlin. His work was first solely based on an information-processing theory (basically Shiffrin & Schneider 1977), but later it incorporated Rumelhart & Norman's (1978) notion of restructuring, in order to account for the idiosyncrasies of the language acquisition process. The result is a conglomerate of insights from the most different areas related to psychology: information-processing, cognitive science, psycholinguistics, which is far from satisfactory in terms of explaining the acquisition of a second language, the ultimate goal of his research. It is so unsatisfactory that McLaughlin ends up recognizing its gaps and giving in to linguistic theories.

This chapter is divided into two main sections: the psychological underpinnings of the model and their application to SLA. Finally, the consciousness issue is addressed, followed by some concluding remarks.

The psychological underpinnings:

1) Shiffrin & Schneider's theory

Shiffrin & Schneider are responsible for what is perhaps the most comprehensive theory of human information-processing. Their theory encompasses such issues as: detection, search, attention, perceptual learning, automatic attending (Schneider & Shiffrin 1977; Shiffrin & Schneider 1977), all of them involved in one way or another in the subject of learning.

We could say that learning, in their theory, is a matter of storing information in memory in an organized way. However, the process is more complex and specialized than that. We can start with the concept of memory proposed in their model. Memory is defined by Shiffrin & Schneider as 'a large and permanent

collection of nodes, which become complexly and increasingly interassociated and interrelated through learning' (1977:155). These nodes, when in an inactive or passive state, are called long-term storage (LTS). When they are continuously active, they are called short-term storage (STS).

Despite the fact that in the information-processing area it is commonplace to find words such as *node*, I have objections to the use of the term *node* in a theory that is not neurologicallybased. First, because it lacks a precise definition, and, being a key-word in this concept, it turns the concept into a loose, illdefined one. (McLaughlin has criticized his own theory exactly for its imprecision of key-statements and definitions [see McLaughlin 1987:151]) So, what is a node? A schema? A network, a web of information? On page 155, Shiffrin & Schneider say that 'an individual node may consist of a complex set of information elements, including associative connections, programs for responses or actions, and directions for other types of information-processing'. This explanation might bring some clarification, although it does not minimize the inconsistent use of the term. Speaking of a set of information elements is something quite different from speaking of kinesthetic engrams, which is what programs for responses or actions actually are, and both are equalized in this definition. Kinesthetic engrams are implicit mental representations for actions and responses neurologically feasible (Paradis, personal communication). So, memory is formed of interconnected associations of information, plus kinesthetic engrams, plus 'directions for other types of information-processing', which is also rather vague. I would say that this definition summarizes in a metaphor-like way the contents of the various types of memory, embracing them into a whole, rather vague, definition.

My second objection to the use of *node* relates to its more literal meaning, which embodies physical or physiological features (acc. to Webster, it's 'a thickened, swollen or differentiated area [as of a tissue]'), so that its use would

be justified in a neurolinguistic but not in a psychological theory, since psychology does not deal with brain areas in a physiological sense.

Following the assumptions of the psychological underpinnings, Shiffrin & Schneider state that the function of STS is to keep information until it is stored permanently in LTS, and then discard it (forgetting). STS has a limited capacity for storage (Miller's [1954 cited in McLaughlin 1983] magic number: 7±2) and a limited time to keep information (some seconds). Beyond those limits, information in STS is either transferred to LTS or forgotten.

Learning is subject to two kinds of processes, which use STS and LTS. Being seen as transfer of information to LTS, learning involves a stage of controlled processes initially, until information processing becomes automatic. Thus, controlled processing is a requisite for storing in LTS.

A **controlled process** is a process that 'utilizes a temporary sequence of nodes activated under control of, and through attention by, the subject' (Shiffrin & Schneider 1977:156). Each activation requires the attention of the subject over again, so that the capacity of performance of controlled processes is limited due to selective attention.

An **automatic process** is a sequence of nodes that becomes active in response to input. This activation does not require conscious control or attention. For that reason, automatic processes are called capacity-free processes.

The transfer of information to LTS happens only under the requisite that the information being transferred pre-exists in STS. When transferred to LTS, new associations of information structures (nodes) are formed, associations that were not there before. 'Transfer', therefore, does not simply mean changing information of place, from STS to LTS, but modifying it. With consistent training (and only with that), these controlled processes become automatic, and thus much faster, working in an unconscious manner. A crucial claim in this theory, whose implications are relevant to this study, is that 'what is stored is

what is attended to and given controlled processing', or 'some degree of attention or controlled processing is a prerequisite for storage' (1977:157). By implication, there is no implicit learning, in the general sense that is used in cognitive psychology and neurolinguistics, sense which is well put together in the words of Reber (1989:229-30):

> [Implicit learning] is an unconscious process which yields abstract knowledge. It results from the induction of an abstract representation of the structure that the stimulus environment displays, and this knowledge is acquired in the absence of conscious, reflective strategies to learn. [...] Implicit learning produces a tacit knowledge base which is abstract -- such knowledge is optimally acquired independent of conscious efforts to learn.

To be fair with McLaughlin, we cannot omit that he talks of implicit learning, and so do Shiffrin & Schneider, but their view is definitely distinct from what is currently known as implicit learning, as defined above by Reber. McLaughlin (McLaughlin, Rossman & McLeod 1983:142) is rather unclear and extremely vague when he says that attention to formal properties of language does not have to be focal all the time, it might be peripheral: this takes place in what he calls *implicit learning*, which is defined as the 'relatively passive apprehension of linguistic structure', and in the case of *analogic learning*, which is nothing but inductive learning. Moreover, some tasks where attention is taken to be peripheral are considered controlled in his view, which is not the case. As we will see in the neurolinguistic chapter, implicit learning produces a type of knowledge which is automatic. In fact, McLaughlin misinterprets the concept of implicit learning, even though he does have a place for true implicit learning: it is when he speaks of 'performance in communication situations' (ibid:143), where the subject focuses attention on what is being said and not on how. In such situations, information processing does not involve attention to formal properties of language: thus, it is automatic.

An example of a situation of this kind, according to McLaughlin, is overhearing a conversation in the target language.

Shiffrin & Schneider also talk of incidental learning in a misconceived way, in my view. For them, it is a synonym for implicit learning. Incidental or implicit leaning is when no extended rehearsal takes place, but indeed some learning occurs, since the input items are 'attended to during presentation' (1977:158). In any case, the fact is that for these authors, and I would say for cognitive theories in general, there is no such thing as acquisition of knowledge without attention. This is a serious flaw in these theories, since, as we will see in the neurolinguistic view, there is evidence of a type of memory in which what is stored is NOT what is attended to, but something else. This is known as procedural competence or implicit memory.

2) Rumelhart & Norman's 'Restructuring'

Although McLaughlin theoretical bases on the restructuring issue are both Cheng (1985) and Rumelhart & Norman (1978), Cheng's position constitutes much more a critique of the information-processing theory and a call for a restructuring approach rather than a theory of how the restructuring process takes place in the mind. Thus, in the following lines, I will develop Rumelhart & Norman's view.

The very origin of the concept of restructuring is Piaget's notion of 'structural changes' that happen in the cognitive system, as it undergoes maturation (McLaughlin 1990:117). However, more recently, restructuring has taken on different connotations depending on the area in which it is used. Within developmental psychology, for instance, it means a 'snapshot' or clicks of sudden understanding, where everything learned so far seems to go to its right place.

The notion of restructuring developed by Rumelhart and Norman (1978) derives from cognitive psychology. It was developed to explain the acquisition of semantic knowledge in memory.

Rumelhart & Norman (1978), in their approach to learning, distinguish three modes of learning: accretion, tuning and restructuring. Accretion is the simple adding of information to one's existing data-base (or perhaps we had better call this cognitive structure, following Ausubel), without modifying the organization already present. It occurs through exposure to the concepts. We can compare this type of learning to the acquisition of explicit knowledge, both encyclopedic and episodic. Tuning is the modification or evolution of already existent memory structures (which are also called knowledge structures or schemata) into new ones. Schemata are tuned in order to improve their accuracy, generalize or specialize their applicability, or determine a value of the schema that was not specified. Finally, restructuring is the creation of entirely new memory structures. It is really rearranging knowledge that has been already acquired in the light of new knowledge, thus creating new schemata, more adequate or closer to reality. It generally happens when the present organization of knowledge does not make sense anymore to new incoming information and a new organization is required to integrate the two sets of knowledge.

The psychological view applied to language learning

Cognitive Psychology sees language as a complex cognitive skill like any other, and language learning, like the learning of any other skills, following therefore the same principles of general learning. Based on that view, McLaughlin's model assumes that any complex task undergoes a continuum that ranges from higher to lower skills or from higher tasks to sub-tasks. Subtasks have to become automatized in order for higher tasks to take place.

McLaughlin states that speech is an example of a such continuum of skills. It goes from the microgenesis of the utterance up to its acoustic realization. The high order task is the intent to communicate. In order for it to be achieved, sub-tasks have to be realized, like morphosyntactic choice, lexical access, phonological realization. However, it is clear that this is a case of *language processing*.

I argue that the automatic-control continuum can only account for language processing or access to language. It cannot be used as an explanation of second language acquisition, because it is an instance of language *use*, rather than acquisition.

If such a continuum does not apply to language acquisition, to what extent, then, is McLaughlin's work psychologically-influenced?

It is already known that the SLA process is not a continuous one, it shows certain discontinuities, i.e., some forms that appear to have been acquired eventually regress to a previous stage of acquisition. Some forms that have been extensively practiced (so that one would say that they should have become automatic) remain unlearned or pass through a period of backsliding. In the acquisition of the English past tense of irregular verbs, for example, learners produce the correct verb forms at a certain stage, but subsequently they regularize these forms (like *goed, comed*), and then the correct forms reappear. Regularization is a stage of acquisition of the past; in which all forms, regular and irregular, are regularized, since regularization is still non-systematic. In fact, systematic and non-systematic variability are terms devised by Ellis (1985) in his description of interlanguage. Ellis noticed that in the early stages of acquisition of a second language there is free-variation or non-systematic variability. When new forms enter, they cause a restructuring of the whole system until form-function correspondence is achieved, that is, each form is given a function, a meaning. This is the stage of systematic variability, which takes place until all

forms are used correctly. This type of evidence shows that learners learn not only from practice, but that their learning also depends on cognitive maturation. It also shows that SLA is a process sui generis, peculiar to language. Such thinking gave rise to the famous concept of 'interlanguage' and its not less famous U-shaped curve. A full description of interlanguage is provided by Larsen-Freeman and Long (1991).

It is exactly this kind of evidence, the so called interlanguage evidence, that has intrigued McLaughlin. Realizing that the automatic-control continuum did not account for this type of data, which McLaughlin (1990:116) calls 'puzzling data', he found an explanation in the notion of 'restructuring', a mode of learning developed by Rumelhart & Norman (1978) and Cheng (1985), among others, as explained in the 'Psychological underpinnings' section.

It is worth considering how the notion of restructuring applies to SLA.

According to Karmilloff-Smith (1986 cited in McLaughlin 1987:144), the restructuring process has at least three phases:

1 Automaticity phase, also called bottom-up or data-driven. In this phase there is no preoccupation with organization of data provided by input. Once the procedures in this phase become automatized, learners can go to a 'metaprocedural level', which is phase 2.

2 Phase of organization-oriented procedures; the learner tries to simplify, unify, gain control over the internal representations. This phase is also called top-down phase; it is the phase of restructuring per se.

3 Integration of the bottom-up processes of phase 1 and the top-down processes of phase 2. At this phase external feedback can be considered without harm to the cognitive structure organization.

McLaughlin makes a claim for restructuring in syntax, learner strategies, semantics and reading. Restructuring in these areas is taken to be evidence of the

restructuring process in second language learning. Now, I will explain briefly each type of restructuring.

Restructuring in syntax can be found in the work of Pienemann, Meisel & colleagues (see Pienemann's chapter), who researched the acquisition of syntax by Spanish and Italian immigrants learning German.

In order to explain restructuring in learning strategies, McLaughlin (1990:123) takes Ellis' (1985) definition and categorization of learning strategies. Note that Ellis' use of the term *strategies* does not imply any level of consciousness; it might be considered a synonym for *processes*.

Initial learning strategies are simplification strategies (overgeneralization and transfer). In this stage, the learner is involved in building an internal representational system, which is simpler than the input and based on first language and on universal principles. Later on, learning strategies change to inferencing and hypothesis-testing. It is these two strategies that govern restructuring, according to McLaughlin (1990:123). They are basically related to rule analysis: inferencing is coming to the rules and hypothesis-testing is testing them.

Another evidence of restructuring related to learning strategies lies in the study of 'novice-expert shifts' (McLaughlin 1990:123). 'Novice-expert shifts' are the changes that take place as the beginning learner becomes expert in a certain area in which s/he is learning or acquiring knowledge. Studies show that there is difference between the schemata of beginners and more advanced learners. The last ones restructure schemata in such a way that what results is abstract schemata. Beginners, on the other hand, do not do this. They have concrete representations. Other studies reported in McLaughlin (1990) that analyze learning strategies specific to language, and which use artificial grammars show that the difference between multilinguals and monolinguals or bilinguals is in terms of **flexibility in switching strategies**, strategies of the kind of: mnemonic

strategies, linguistic strategies, and others. Besides, multilinguals have shown greater flexibility in restructuring their mental representations of the linguistic system. In sum, they have improved their capacities for controlling strategies and representations. This might be due to the use of metacognitive strategies or 'learning to learn', which is a characteristic of the multilingual person.

The evidence for semantic restructuring is also controversial, perhaps the most controversial one. Semantic development in a second language, according to Ijaz (1986 cited in McLaughlin1990:122), consists of mapping two lexical and conceptual systems onto each other. The learner supposedly restructures existing first language concepts to develop new concepts that correspond to the SL lexical items. If not mistaken, such affirmation is at least inaccurate, specially when seen in the light of neurolinguistic studies. The subset hypothesis, held by Paradis (see neurolinguistic chapter), argues that we have a general cognitive store, where all the concepts or mental representations are stored, and store(s) for as many languages as there are. These stores, one for each language, comprise the language phonology, morphology, syntax and semantic constraints on the lexicon. The mental representations of the cognitive store are constrained by language-specific semantic constraints. The 'creation' of a lexical item in the SL does not pass necessarily through the L1; it is the mental representation or concept in the conceptual store that is constrained by the SL constraints. Interference from L1 obviously can occur in both compound and subordinate bilingualism. But it does not seem that restructuring takes place in the manner explained by McLaughlin. Restructuring does take place within the SL lexicon, as it does within L1, and interference may be the triggering stimulus for this restructuring, but that is not the same as saying that SL meanings result from the restructuring of L1 ones. In fact, the neurolinguistic view held in this dissertation presumes some kind of predetermined semantic constraints in the

acquisition of the lexicon, which is responsible for this difference among both views.

Reading provides further evidence of restructuring presented by McLaughlin (McLeod &.McLaughlin 1986). It is the result of an experiment carried out by him and McLeod (ibid), in which errors in reading tasks of beginning and advanced ESL students were analyzed. The errors of the beginning students were found to be non-meaningful, and due to students focusing on the graphic aspects of the text. Advanced students had fewer errors in reading and were more competent in decoding the text, but still decoded it, which is not really a good tactic to use in the reading process, since we already know that the competent reader does not just decodes the text, but makes optimum use of reading strategies, like prediction, for instance. Thus, McLaughlin's students had the linguistic competence necessary to leave the 'decoding' stage, which is a common initial stage in the reading in a second language process, and go to the stage of interacting with the text, but they did not do so. The explanation for this behavior is that even advanced students had not reached the point of restructuring in their reading performance.

Besides restructuring, another possibility later found by McLaughlin as a way to explain the idiosyncrasies of interlanguage is to assume that some part of acquisition develops in a predictable way, as sequences that consist of 'routines that are already automatized when they emerge' (Sajavaara 1978 in McLaughlin 1987:149). Under this assumption, two routes are implied:

1) a route determined by linguistic constraints, which is predetermined and automatic when of its emergence; and

2) a route which is not predetermined, that goes from controlled to automatic processing. This route needs to be 'routinized'.

It seems that this possibility of pre-automatized routines proposed by Sajavaara would be plausible if it were assumed that each route is the result of

a different process; one is the source of implicit memory and as such is acquired incidentally, stored implicitly, not open to introspection, and so on (see the neurolinguistic chapter); and the other is the source of explicit memory. However, this is not the case in this theory -- McLaughlin does not accept incidental or implicit acquisition in the sense that the subject is not aware of what s/he is acquiring. How then, are such automatic, predetermined sequences supposed to be acquired? This part of his theory really leaves many crucial questions unanswered.

Practice or rote learning ?

The acquisition of a cognitive skill results from the automatization of routines. These routines require attention and 'mental effort' in the beginning, that is why the process is said to be controlled. But through practice, or 'routinization', the process becomes automatic; that also means that it becomes effective, rapid, and that it is used unconsciously.

The main requisite for a complex cognitive skill to be learnt is repetition or practice. As McLaughlin (1990:115) puts it,

> *Repetitio est mater studiorum* -- practice, repetition, time on task -- these seemed to be the critical variables for successful acquisition of complex skills, including complex cognitive skills such as second language learning.

It is amazing that McLaughlin does not seem to give importance to the motivation involved in practice, that is, the inner drive of the learner to say something. The motivation involved in learning is not accounted for, or, in neurolinguistic terms, there is no involvement of the lymbic system, no need for meaningful learning, in Ausubel's words. As will be shown in the neurolinguistic chapter, Paradis points out that the lack of involvement of the lymbic system produces a kind of learning that does not lead to linguistic competence. Linguistic competence is acquired in the presence of this inner

drive to communicate. When this inner drive is present, it turns the attention to *what* is being said and away from *how* it is being said. This is how linguistic competence is acquired.

To me, this is a serious weakness of McLaughlin's theory; if we take it to the last consequences, this means that rote learning can take place and rote learning is at most behavioral in essence. It is a limited kind of learning. This type of theory, as put by Cook, 'reminds us that language is also behavior and skill' (1993:124). What he forgets, along with McLaughlin, is that recent research emphasizes exactly the opposite, namely, that language is *not* mainly behavior, but much more than that, it is a very special type of knowledge that develops in a unique way, that is acquired implicitly (in the absence of conscious efforts to learn), that is creative, and that has self-generating power, known as linguistic competence. Not surprisingly, McLaughlin's view is known to hold the 'non-uniqueness' position, that claims that there are not language faculties, but all knowledge, including linguistic knowledge, springs from a general cognition.

The consciousness issue

It is common to find the notion of controlled processes associated with the feature [+ conscious] and the notion of automatic processes associated with the feature [- conscious]. McLaughlin (1987) points out that according to Shiffrin & Schneider, both controlled and automatic processes can in principle be conscious or not. The non-conscious controlled processes are known as 'veiled', and these are those that occur so rapidly that they are unnoticed by the subject. The opposite of 'veiled processes' are the 'accessible' ones. As for automatic processes, they are omitted. In principle, they are always unconscious (because of their speed and because they must operate in parallel), so that the conscious/unconscious distinction does work in this case, despite McLaughlin's claim that consciousness is not a good criteria to distinguish one from the other.

In sum, the acquisition of a second language can be seen at least in two ways. One way to look at it is as a predetermined process that needs to be triggered by input and by a strong desire to communicate in the target language. This process does not imply an intense 'mental effort', because what is acquired is scarcely perceived and definitely not rehearsed; at best, practiced within a relevant context. Any 'mental effort' is concentrated on the message to get across in the target language. In this view, the linguistic system is abstracted from input, rather than effortfully built on the basis of rehearsal.

Another way of looking at it is as a constructive process, in the very sense of Piaget (and McLaughlin's theory does have a constructivist rationale), where the cognitive structure is built via interaction with the environment. As a result, the grammar of the language is organized (organization being the trigger for development in this view) by storing information in memory at the expense of rehearsal.

In this second view, memory is seen as a set of nodes, which are elements of information. Learning is making complex interconnections among the nodes. Long-term storage is said to be a state in which nodes are passive. When they become active, they are called short-term storage. Two processes are said to participate in the interconnection of nodes: controlled and automatic processes. Controlled processes require attention, therefore, they are limited, since the focus of our attention is selective. They also demand more energy to be processed, probably because they are conscious. Automatic processes, in turn, demand less energy, are very effective and do not require attention to be performed. Several automatic processes can occur at the same time, which we call 'parallel processing'. McLaughlin (1990:125) says that the automaticity process is 'essentially learning through accretion' or adding to the cognitive structure, in other words. Other changes in the cognitive structure take place through restructuring. As to practice, in his view, it may have two purposes: 1

improve performance, by automatizing sub-skills; 2 lead to restructuring in performance, by the reorganization of the cognitive structure. The effects of practice do not lead to immediate skilled action but cumulate as learners develop more efficient procedures.

A question that remains, or perhaps emerges from a model like McLaughlin's, that does not presume any pre-existent linguistic knowledge in the learner's mind, is: why some things are attended to and stored at the expense of others?

We know that some things are attended to and subsequently stored, and others are not. But we do not know why restructuring takes place with some information and not with others. What causes restructuring? What determines which linguistic information undergoes restructuring and which undergoes storage in an information-processing mode?

Being a cognitive psychologist, McLaughlin says that it is the drive for organization that governs human experience that triggers restructuring. This claim is a constructivist one, i.e., based on the findings of Piaget, who assumes that all human experience is organized and it is this drive for organization that leads to cognitive development. What we arrive at here is the famous debate between constructivism and innatism. It remains unclear whether they are opposite sides or complementary to each other (cf. Piatelli-Palmarini 1980:XIV).

To what extent can McLaughlin's model be said to be an acquisitional/learning model if it does not speculate about the causes of learning? Nor about WHAT is acquired, that is, the competence system or whatever that is the resulting object of acquisition?

The fact is that McLaughlin's model is very limited, basically because cognitive psychology has been unable to explain important linguistic data emerging from language acquisition. I would say that his model at best explains second language use and part of the acquisition of declarative knowledge, but

even so, it lacks development in issues as attention, for example, which is not explained despite its crucial role in the theory. We must, however, give to McLaughlin credit for recognizing the weaknesses of his model. His remarks towards that are:

> Note that cognitive psychologists see the same principles applying to complex skills such as reading, writing, or learning a second language as apply in the case of motor skills such as driving, typing or playing tennis. (McLaughlin 1990:115)

> Such a cognitive psychological description of second language learning provides, non the less, a partial account, and needs to be linked to linguistic theories of second language acquisition. By itself, for example, the cognitive perspective cannot explain such linguistic constraints as are implied in markedness theory or that may result from linguistic universals. These specifically linguistic considerations are not addressed by an approach that sees learning a second language in terms of the acquisition of a complex cognitive skill. (ibid:126)

REFERENCES

Cheng, P. 1985. Restructuring versus automaticity: alternative accounts of skill acquisition. *Psychological Review* 92:214-23.

Cook, V. 1993. *Linguistics and Second Language Acquisition*. London:MacMillan Press.

Ellis, R. 1985. *Understanding Second Language Acquisition*. Oxford: OUP.

Larsen-Freeman, D. & M. Long. 1991. *An Introduction to Second Language Research*. New York:Longman.

McLaughlin, B. 1987. *Theories of Second-Language Learning*. New York:Edward Arnold.

McLaughlin, B. 1990. Restructuring. *Applied Linguistics* 11(2):113-28.

McLaughlin, B., T. Rossman & B. McLeod. 1983. Second language learning: an information-processing perspective. *Language Learning* 33(2):135-58.

McLeod, B. & B. McLaughlin. 1986. Restructuring or automaticity? Reading in a second language. *Language Learning* 36(2):10-23.

Piatelli-Palmarini, M. (ed.). 1980. *Language and Learning: The Debate between Jean Piaget and Noam Chomsky*. Cambridge, Massachusetts: Harvard University Press.

Reber, A.S. 1989. Implicit learning and tacit knowledge. *Journal of Experimental Psychology: General*. 118(3):219-35.

Rumelhart, D.E. & D.A. Norman. 1978. Accretion, tuning, and restructuring: three modes of learning.In Cotton, J. & R. Klatzky. *Semantic Factors in Cognition*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Schneider, W. & R.M. Shiffrin. 1977. Controlled and automatic human information processing: I. Detection, search and attention. *Psychological Review* 84:1-66.

Shiffrin, R.M. & W. Schneider. 1977. Controlled and automatic human information processing: II. Perceptual learning, automatic attending and a general theory. *Psychological Review* 84(2):127-90.

CHAPTER 9

CLASSIFYING SLA THEORIES

After reviewing a number of psycholinguistic theories and finding the domain of cognitive processes quite non-consensual and controversial, it was a natural drive to look for similarities and distinctions among theories studied. Thus, a classification emerged from the similarity I found to be most relevant throughout the theories: the areas which constituted their source of influence, or the areas from which they borrowed their theoretical constructs. In my opinion, recognizing the grounds of psycholinguistic theories of SLA clarifies the whole domain of cognitive processes.

The classification I propose somehow summarizes the study of theories examined in this dissertation up to now by separating them into two groups: linguistically-influenced theories and psychologically-influenced theories. In this sense, this chapter is conclusive in nature.

By the time this classification was being organized, other classifications appeared in the literature, showing the convergence of research towards a clarification to the picture of SLA theories. Therefore, before presenting my proposal, I will briefly present the different classifications that emerged, avoiding lengthy descriptions of theories involved in the classifications, even the ones that were not described in the previous chapters. Comprehensive descriptions of such theories can be found in the respective references.

Still before presenting the classifications, I would like to elaborate on the controversy that permeates SLA theories as far as the psycholinguistic processes are concerned. I will try to elucidate what I consider to be the main controversial aspects and their causes.

The controversy

A central source of controversy, pointed out by McLaughlin (1990a), is the use of abstract, subjective issues such as consciousness as constructs for theories. Because it is very difficult to precise which mental states are conscious and which are unconscious, which makes such notions unspecific and untestable, this type of construct should be avoided in theories. I disagree partially, for I think that while such notions cannot be avoided in psychologically-related theories, the meaning they take in a certain theory should be at least clearly stated to avoid ambiguities.

A second source of controversy I found is that some researchers (Larsen-Freeman 1991) argue that SLA theories are explanations rather than descriptions of the SLA. As such, they can encompass all kinds of hypotheses and assumptions, because assumptions do not require support, while claims, which are the ultimate result of descriptions, do. The result is the vagueness of concepts that underlie the theories, not to mention the vagueness of the theories themselves.

A third source of controversy within SLA theories is the fact that SLA is a multi-disciplinary area. This fact raises problems with methodology, backgrounds and interests, and terminology, among others, as shown below.

Because SLA is a new autonomous discipline (Larsen-Freeman & Long 1991:12-5), it has not established its own methods of research, drawing still from methods used in education and first language acquisition. Take, for instance, the controversy involving introspective methods, a traditional psychological methodology that still faces severe resistance from linguists.

The other problem risen by multi-disciplinarity, this time pointed out by Snow (in press), refers to the different background and training of SLA researchers and thinkers, besides their different interests, which produce

separate groups of researchers/lines of research unable to converge into a consensual view.

The terminological problem is perhaps the most serious problem deriving from a multi-disciplinary enterprise and deserves a more careful consideration. Despite the fact that a large number of terms used in SLA have counterparts in the contributing areas, each source-area prefers its own terminology, making it impossible to reach a consensus.

Even the term *psycholinguistics* can be pointed out as causing much controversy. I can point out at least three meanings of this word at the present time.

The first one refers to the linguistic tasks of production and comprehension (or reception). Cook (1993:267) calls such tasks *speech production*; Sharwood Smith (1991:12) refers to them as *on-line processing*, *on-line control*, and *knowledge processing*, and Bialystok (1990b:116), who has a whole theory about it, calls them *language processing*, which I consider the best option; Chomsky (1980:201-2) has called these tasks *production and interpretation processes*.

The second definition is related to the linguistic subdiscipline upon which a theory is based. This meaning refers to a second connotation the term takes on in Applied Linguistics: 'it is the study of (a) the mental processes that a person uses in producing and understanding language, and (b) **how humans learn language**' (Richards, Platt & Weber 1985:234). Hence, it is a synonym for cognition involving language. This is the meaning taken in this dissertation, for I believe that it describes what the theories attempt to do: explain the mental processes involved in the learning of language. Bialystok (1990a:636) says that distinguishing among theories according to their linguistic subdiscipline 'is rather effective ... as it clarifies the ways in which the theories are different while legitimizing each as a valid description of SLA'.

The third meaning of this word is a synonym for information-processing theories of language, those which emerge from cognitive psychology and which focus on performance rather than competence.

In his 1986 article, Sharwood Smith points out the huge misunderstanding that surrounds the term *psycholinguistics* -- and its consequences, sometimes serious ones, such as the expectation on the part of certain researchers that the Chomskyan notion of derivational complexity has to have psychological reality. He reminds us that Chomsky never claimed that derivational mechanisms are real mental processes, or that the notions of competence and performance are more than abstract conceptualizations, and indeed there is no reason, he says, why such a theory cannot be considered psychological, as other theories that attempt to describe 'observable behavior'.

It is within this perspective that Sharwood Smith (1986) mentions several areas which are generally considered to belong to Psycholinguistics, which offers us a hint of how polemical the term is, namely, Psychology, Linguistics , Theoretical Psycholinguistics. Among other things, he concludes that 'Chomsky's territorial claim ... is to *theoretical* psycholinguistics'.

I fully agree with him, since Chomsky's theory is not restricted to describing the linguistic system (although he is certainly known for doing so), but he also explains how this linguistic system is acquired, the *psycholinguistic* variables involved, such as the LAD, the powerful Universal Grammar and the notion of 'cognizing', a unique process for developing linguistic competence.

The fact that Chomsky's work is theoretical rather than experimental has to do with its reliance on a hypothetical-deductive type of method, which uses a rationalistic approach instead of an empirical one so as to explain rather than describe a particular aspect of human behavior (see Scliar-Cabral 1991:20-1 for further discussion).

Although traditionally linguistics was concerned with the study of competence, whereas psychology, and later psycholinguistics should take care of performance, Chomsky (1980:201-2) did not agree with such a division:

> Thus, linguistics is taken to be the field that relies on informant judgments, elicited material, whatever limited use can be made of an actual corpus, and so on, to try to determine the nature of grammar and UG. Its concern is competence. Psychology, in contrast, is concerned with performance, not competence; its concern is the processes of production, interpretation and the like, which make use of the knowledge attained and the processes by which transition takes place from the initial to the final state, that is, language acquisition. To me, this distinction has always seemed quite senseless.

The very claim that linguistics is not to be considered a 'behavioral science', but a 'science of the mind' (Chomsky 1972:65) was sufficient to trigger a debate. As McLaughlin (1990b:113) points out, the issue here is that *evidence* (behavioral evidence) studied should not be confused with the *goal of the study*. So, Chomsky studies behavior in order to understand the human mind. That is the reason why he considers Linguistics a subarea of Cognitive Psychology (ibid:28,88). There lies one source of the whole debate around the real object of study of psycholinguistics.

Having finished this discussion on the conflicting aspects involving SL theories, I now turn to the different SLA classifications quoted in the literature, as well as my own. They are: McLaughlin's (1990a), Larsen-Freeman's (1991), Bialystok's (1990a) and Snow's (in press).

The classifications

In his article, McLaughlin (1990a) discusses the face validity of theories which rely on the conscious/unconscious distinction. Despite the fact that he does not attempt to categorize theories in the conventional sense, he does so through analysis of different debates among several authors:

1 The Krashen (1979)/McLaughlin (1978) debate, which refers basically to the acquisition/learning dichotomy;

2 The Reber (1976)/Dulany (1984) debate, which relies on the notion of implicit versus explicit learning;

3 The McClelland, Rumelhart (1986)/Pinker, Prince (1988) debate, which is a connectionist debate, and as such deals with the enigma of whether language consists of a network of input-generated units which are strengthened or weakened through parallel processing, or whether it consists of mental representations of rules.

The debates can be summarized in the following chart:

Krashen/McLaughlin	Reber/Dulany	McClelland,Rumelhart/ Pinker, Prince
acquisition x learning automatic x controlled processing	implicit learning explicit learning	Connectionism unconscious mental rules

Fig. 1 McLaughlin's debates

Larsen-Freeman (1991) classifies theories as nativist, behaviorist or environmentalist, and interactionist. Nativist theories are those in which 'learning depends upon a significant, specialized innate capacity for language acquisition' (ibid:323). They are best exemplified by Chomsky's theory of Universal Grammar, which gave rise to many SLA studies (White 1988, Felix 1985). The objective of these theories is the description of competence or grammatical knowledge. Behaviorist or environmentalist theories are those in which 'the learner's experience is more important than innate capacity' (ibid:323). This division includes Connectionist/Parallel Distributed Processing (PDP) models, which do not presuppose any innate ability for the acquisition of languages. Finally, interactionist theories refer to those in which 'both internal and external processes are responsible [for SLA]' (ibid). Interactionists or variationists tend to explain 'how knowledge gets realized as use'. It is represented by Ellis' (1985) Variable Competence Model. This model is based on Tarone's (1979, 1983) 'Capability Continuum Paradigm'. Linguistic knowledge is described by way of a continuum of speech styles, which ranges from the careful style to the vernacular. The linguistic knowledge (and thus the styles) is accessed according to the pragmatic context. Ellis goes further in his model, assuming that what enhances learning is free variation.

Larsen-Freeman's classification is sketched in the following chart:

Nativist	Behaviorist or Environmentalist	Interactionist or Variationist
Chomsky's UG applied to SLA (White, Felix)	Connectionism/PDP (Rumelhart,McClelland & PDP Research Group)	Variable Competence Model (Ellis based on Tarone)

Fig. 2 Larsen-Freeman's classification

In her article, Bialystok (1990a) makes objections to a previous classification of SLA theories used by Spolsky (1989), originally proposed by Chomsky (1965), which divides theories into competence and processing theories. Bialystok not only objects to Spolsky's typology, but she also re-classifies the theories, based on the assumption that theories usually classified as competence theories do not fulfill the criteria posed by Chomsky to describe a competence theory: knowledge as mental structures and idealization of operation of the competence system. In this way, the information-processing theories, known by Spolsky as processing theories, are actually competence theories, because they emphasize the structure of the system and not its use. On the other hand, the variability theories, known as competence theories are in fact processing theories, because they explain access to use language, or, in other words, learning is described **procedurally**. According to Bialystok, a processing theory must be 'neutral, regarding the structure of the mental representations that underlie performance', and they must be 'descriptions that apply over a limited and specific point in time' (ibid:645-6).

Competence theories can be exemplified by theories derived from Chomsky. Another example is Jackendoff's (1987) theory, also known as the Preference Model. In fact, what is explained by Jackendoff is a process, but his theory is classified as a competence theory because, according to Bialystok (1990a:645), it is 'an idealization of how knowledge stored in certain kinds of mental structures' works.

Processing theories are, for example, Tarone's (1988) model and Connectionist models (Rumelhart & McClelland 1986) because these models explain the learning process and cognition without assuming a rule system. Althoughthe Connectionist models propose rule-like behavior, there is no such thing as a 'competence' system.

Figure 3 shows Bialystok's classification:

Competence	Processing
Information-processing models (Jackendoff)	PDP/Connectionist models (Rumelhart, McClelland; Tarone)

Fig. 3 Bialystok's classification

Finally, Snow's (in press) categorization of theorists includes five major groups, the first one related to second language pedagogy and focusing on product rather than on process, and the last one a sociolinguistic division. These two groups are not of interest to this paper. The other three, which involve cognitive theories of SLA, are the following:

1 Child language researchers who believe that second language acquisition is similar to first language acquisition in many ways. This group refers to developmental psychologists. Topics researched by this group are, for instance, whether SLA resembles first language acquisition, and in what ways it does so (Ervin-Tripp 1974); and the effect of the environment on the development of SLA (Snow 1990).

2 Linguists interested in Universal Grammar applied to SLA. Theories that have a Chomskyan influence belong to this group. These theories are also called competence theories by Snow, and they focus on rules. The most classic example is White 1990, who argues that UG operates powerfully in SLA by shaping and restricting the second language.

3 Psycholinguists interested in language processing issues, who see language learning as a type of information-processing. These models focus on performance in opposition to competence, and on strategies in opposition to rules. McLaughlin's (McLaughlin, Rossman & McLeod 1983) information-processing perspective (also called Cognitive theory) belongs to this division, as well as MacWhinney's (1987) Competition model applied to SL research. This model has to do with processing tendencies that are transferred from the L1 to the SL. Sentence interpretation is one of these tendencies. According to the model, sentence interpretation 'is governed by accumulated knowledge of the likelihood that certain cues indicate certain semantic roles'. The processing of sentence interpretation is conveyed to the SL, but if the SL does not follow the same kind of processing, the transfer can impede rather than enhance the learning process.

According to Snow (personal communication), most theories and models have characteristics of different groups, or at least of more than a group, in such a way that it is hard to exemplify a group by using an individual theory or author.

I have summarized Snow's classification in Figure 4:

Child language researchers (Developmental psychologists)	Linguists	Psycholinguists
L2 = L1 theories (Ervin-Tripp; Snow)	Chomsky's UG applied to SLA theories or competence theories (White)	SL information-processing theories (MacWhinney; McLaughlin et al.)

Fig. 4 Snow's classification

The proposed classification

I propose a classification of theories which considers the central feature of a psycholinguistic theory of second language the source areas in which they are rooted. The proposed classification is divided into models or theories that have a linguistic influence and those which have a psychological influence as they try to explain the SLA process. Since all of them, in my view, could be considered psycholinguistic theories, the term had to be avoided in this classification so as to prevent misunderstandings.

The fundamental issue that underlies the theories is the relation among grammar, the language processing system and the general cognitive system. There are two opposing views concerning this issue.

The mentalist view of language (based on Chomsky 1972, 1980 and Fodor 1983) holds that 'language is, or is part of, a specific mental sub-system with its own idiosyncratic structure and design (the language faculty); it is one of a

system of interacting modules which make up the mind, each of which has its own particular properties, and each of which may itself comprise distinct though interacting components' (Carston 1988:39). This view postulates that the mind develops as a modular structure with specific capacities in their own way. 'The mind is modular, i.e., with the LAD as but one of various 'mental organs' that interact with each other and with the input to produce linguistic competence' (Chomsky 1980). In this mentalist view, language has its own principles, which are defined independently of other cognitive systems. In this view, also, grammars produced by linguists are taken to be 'real mental entities'.

This language system is innate and it has to be so. It would not be possible to have modularity without innateness because the mind must be innately programmed for these special faculties, or how would they develop?

The opposite view is called the 'language fallout view' or the 'instrumentalist view' by philosophers and developmental psychologists like Piaget, where it finds its roots. It posits that the structure of the language should be explained by the principles of general intelligence: 'the structure of the language would fall out as a consequence of the structure of the cognitive system itself' (Tanenhaus, Carlson & Seidenberg 1985 cited in Carston 1988:40). For them, the mind develops as a whole. In this view, grammars are just frameworks, not something real, not 'mental primitives'. The fallout view faces strong disconfirming evidence: the very complex knowledge of language that young children have.

The following topics, in fact, stem from this first fundamental issue just discussed. The first one is related to the nature and representation of the linguistic system in the mind. The second one is concerned with the acquisition of the linguistic system. The third one is related to metalinguistic knowledge.

While theories influenced by linguists propose that the acquisition process produces a 'competence system', which is language-specific in essence, theories

influenced by psychology propose the building up of a cognitive structure. Thus, what we call competence in a linguistic theory would have a counterpart in psychological theory -- the cognitive structure. This cognitive structure (also called knowledge structure, semantic base, network of information, web of information, and so on) is a network of information systematically organized. Its description/organization varies from theory to theory among psychologically-influenced theories. Some theories, such as Ausubel's Assimilation theory, and also an earlier view of Rumelhart (Rumelhart & Norman 1978), argue that the cognitive structure is organized hierarchically, on the basis of hyponyms and co-hyponyms (see chapter 1). McLaughlin's theory, although known as stemming from information-processing, a psychological sub-area, fits in that line. He says that the information is encoded in two memory systems, short-term memory and long-term memory, and that the organization of this last one, where information is kept permanently, may be in terms of 'associative networks or hierarchical systems' (Anderson & Bower 1974 cited in McLaughlin, Rossman & McLeod 1983:138). More recent contemporary theories claim that the mind is made up of millions of connections that are build up *by the environment*, that is, they are not innate.

The most important criticism that can be made to psychological theories is that they do not clearly delimit in their theories the three aspects posed by Cook (see Introduction), and do not recognize that they are not capable of describing the linguistic system and how this system is distinct from other cognitions. In psychological theories, no reference is made to the description of grammar. Most of them actually explain language processing (aspect # 3 in Cook's description) and misconceive it as the description of the language system. Thus, as Cook (1993:267) says, language is a **process** in those theories in opposition to **knowledge** in linguistic theories. 'It is above all a grammar of

processing rather than knowledge, of performance rather than competence. Consequently, answers the **use** question rather than the **acquisition** question'.

The second issue has to do with the acquisition of the linguistic system. The posed processes of acquisition differ radically and this constitutes another dissimilarity among the two trends of theories.

As to linguistic theories, Chomsky says that 'we *cognize* acquired knowledge as well as innate knowledge' (Chomsky 1975 cited in Krashen 1982:102). Those that are influenced by Chomsky say that the process of acquisition is a process which is unconscious and relatively inaccessible to introspection (Sharwood Smith 1991:13). The process posed by linguistic theories resembles that of the first language, the so called 'creative construction'. The natural route/internal agenda is the route taken by this creative construction process.

Theories influenced by psychologists propose the building up of cognitive structure through **assimilation of new knowledge to previous knowledge**. This kind of knowledge acquisition involves storing in short-term memory and long term memory and demands attention and awareness at first, where it depends on controlled processes, and practice, so that these can become automatic processes. In fact, memory models are implied, and in memory models, short-term memory is a synonym for attention or awareness. Such a mechanism is not language-specific in the sense that any kind of knowledge can be acquired in this way, including language knowledge. Thus, language has to be automatized as any other skill in order to be used fluently, since it is seen as an ability like any other, or sometimes as a kind of knowledge like any other. Cook (1993:266) summarizes this, saying that in this type of theory learning is a process that goes from declarative, controlled, attended data to procedural, automatic, non-attended processes. In the next chapter, we will see that this is absolutely impossible in neurolinguistic model, since declarative and procedural

knowledge are completely independent from each other, subserved by different neural substrates (see glossary), and thus one cannot become the other.

Another difference as far as acquisition of the linguistic information is concerned is related to feedback. In psychological theories, it is crucial to have negative feedback for the formation of the knowledge structure. In linguistic theories, we know from Chomsky that feedback is irrelevant and actually does not occur in spontaneous acquisition. In formal acquisition it does, but as Cook (1993:263) says, '[formal acquisition] is only one route to the L2 out of many and does not seem to apply to its most central aspects'.

The issue of metalinguistic knowledge also varies in each branch of the classification. As linguists believe in a very special, unconscious process for language acquisition, and in the inaccessibility of linguistic competence, that knowledge is not the same as metalinguistic knowledge, or knowledge *about* grammar, since it cannot be verbalized. Thus, metalinguistic knowledge must have as its source another 'faculty', and as such it does not interfere in the acquisition of linguistic competence. That is known as the **non-interface position** (Krashen 1985:39), namely, that metalinguistic knowledge cannot be converted into purely linguistic knowledge and vice-versa.

One resulting feature of the metalinguistic issue is that the learning and the acquisition processes (in the Krashian sense) do not belong to the same paradigm. The acquisition process, as described by Krashen, is a notion influenced by linguistics, that produces fluency in the second language whereas the learning process resembles the acquisition of encyclopedic knowledge -- it produces meta-knowledge, which does not enhance fluency but only serves as a monitor. That type of knowledge is known as 'statable' knowledge, that is, it can be verbalized through introspection.

Linguists see an essential contribution of the learner's cognition, besides acknowledging the necessary role of the linguistic environment to the learning process -- input -- and the need for the input to be adjusted to the level of the learner. Cognitive psychologists also recognize the significant contribution of learner's cognition, but give much more importance to the linguistic environment than linguists, since it is the agent of transformation of experience into memory traces. For the linguist, there is not only innate ability to acquire language but

also pre-existing knowledge about the language. Not for the psychologist. In this case, there is only innate ability. The tendency of psychologists to give a crucial role to the environment is becoming more and more evident in contemporary trends of research, such as connectionism. It is so much so that some researchers consider such trends 'behaviorist', arguing that in such theories, 'language comes from the outside -- from input from others and from interaction -- rather than from inside the mind' (Cook 1993:122).

The chart below shows the characteristics and the theories/models that belong to the proposed classification:

	Linguistic	Psychological
characteristics	Modular view UG/internal agenda 'Creative construction' acquisition unconscious competence inaccesible 'in principle'	Language fallout view Memory models Automatic/controlled processes Attention learning conscious cognitive structure access via introspection
theories	Chomsky Krashen Pienemmann Prabhu Seliger Sharwood Smith	Ausubel McLaughlin

Fig. 5 The proposed classification

What might seem to be a limitation of this classification is that psychologically-grounded theories analyzed were limited to McLaughlin's, besides Ausubel's assimilation theory, which was cited much more as a seminal source of influence than as an influenced theory. Actually, there are not many psychological theories that attempt to explain the SLA process without being committed to language processing (following Cook's aspects, this is # 3), which is not really the issue under discussion here. If not for time and space limitations, it would be extremely interesting to analyze the acquisitional view implied in those theories, thus summing to the ones presented here. Some examples are the language processing model for SL (Bialystok 1990b, 1991a, 1991b), former competence/control model (Bialystok 1978); the Preference Model (Jackendoff 1987); the Competition Model (Mac Whinney 1987), ACT (Anderson 1983).

Furthermore, there are the Connectionist theories, the most recent trend of SLA theories, also resulting from information-processing research. Although they aim at describing acquisition of knowledge (aspect #2) as well as the representational level of language (aspect #1) and language processing (aspect #3), they were left out of this dissertation for reasons of space and complexity.

To some extent, characteristics of psychologically-influenced theories presented in this chapter apply to the processing theories of SLA cited above as well as to the connectionist theories. However, it must be pointed out that connectionist theories represent a very radical move in SLA towards the Cognitive Sciences, explaining language knowledge and its acquisition by analogy with systems that present intelligent behavior and are able to interact adaptively with their environments.

In this chapter I have attempted to elucidate the disputatious field of psycholinguistic theories of SLA by setting parameters as to what constitutes a linguistic theory and what constitutes a psychological theory. It was extremely supporting to discover, after arriving to such a classification by myself, that other researchers also share/arrived at the same end point of distinguishing linguistic theories from psychological ones. McLaughlin (1990b) and Cook (1993) can be cited as examples.

At the theoretical level, the level in which the models studied are inserted, the ideal model of SLA seems to be neither a language model nor a learning model, but a learning model applied to language, which accounts for the idiosyncrasies of the language acquisition process at the same time that it works in a manner similar to other types of cognition, because there are aspects in which cognitive and language development overlap, or one leads to the other. Though this classification provides a clear picture of cognitive theories of SLA, it is still limited to a theoretical or intuitional level of research. What may contribute to the further clarification of this matter, showing us a more realistic picture of the process is neurolinguistic research, the content of my next chapter.

REFERENCES

Anderson, J. 1983. *The Architecture of Cognition*. Cambridge, Mass:Harvard University Press.

Ausubel, D., J. Novak, and H. Hanesian. 1978. *Educational Psychology: A Cognitive View*. New York: Holt, Rinehart and Winston.

Bialystok, E. 1978. A theoretical model of second language learning. *Language Learning* 28: 69-83.

Bialystok, E. 1990a. The competence of processing: classifying theories of SLA. *TESOL Quarterly* 24(4): 635-48.

Bialystok, E. 1990b. Language acquisition and language processing. In *Communication Strategies. A Psychological Analysis of Second Language Use*. Cambridge, MA:Basil Blackwell.

Bialystok, E. (ed.) 1991a. *Language Processing in Bilingual Children*. Cambridge: CUP.

Bialystok, E. 1991b. Achieving proficiency in a second language: a processing description. In Phillipson, R., E. Kellerman, L. Selinker, M. Sharwood Smith, M. Swain (eds.). *Foreign/Second Language Pedagogy Research*. Clevedon:Multilingual Matters.

Carston, R. 1988. Language and cognition. In F. J. Newmeyer (ed.) *Language: Psychological and Biological Aspects. Vol. 3 Linguistics: The Cambridge Survey*. Cambridge:CUP. 38-68.

Chomsky, N. 1972. *Language and Mind. Enlarged edition*. New York: Harcourt Brace Jovanovich.

Chomsky, N. 1980. *Rules and Representations*. New York:Columbia UP.

Cook, V. 1993. *Linguistics and Second Language Acquisition*. London:MacMillan Press.

Fodor, J. 1983. *The Modularity of Mind*. Cambridge, MA:MIT Press.

Jackendoff, R. 1987. *Consciousness and the Computational Mind*. New York: Academic Press.

Krashen, S. 1985. *The Input Hypothesis*. New York:Longman.

Larsen-Freeman, D. 1991. SLA research: staking out the territory. *TESOL Quarterly* 25(2): 315-50.

Larsen-Freeman, D. & M. Long. 1991. *An Introduction to Second Language Acquisition Research*. New York:Longman.

McLaughlin, B. 1990a. 'Conscious' versus 'unconscious' learning. *TESOL Quarterly* 24(4): 617-33.

McLaughlin, B. 1990b. Restructuring. *Applied Linguistics* 11(2):113-28.

McLaughlin, B., T.Rossman, & B. McLeod. 1983. Second language learning: an information-processing perspective. *Language Learning* 33(2): 135-58.

Richards, J., J. Platt & H. Weber. 1985. *Longman Dictionary of Applied Linguistics*. Hong Kong:Longman.
Rumelhart, D. E. & D. A. Norman. 1978. Accretion, tuning, and restructuring: three modes of learning. In Cotton, J. & R. Klatzky. *Semantic Factors in Cognition*. Hillsdale, NJ: Lawrence Erlbaum Associates.
Scliar-Cabral, L. 1991. *Introdução a Psicolingüistica*. Sao Paulo: Atica.
Sharwood Smith, M. 1986. Comprehension versus acquisition: Two ways of processing input. *Applied Linguistics* 7(3):239-56.
Sharwood Smith, M. 1991. Language models and bilingual processing. In E. Bialystok (ed.)
Snow, C. In press. In J. Berko Gleason & N. Bernstein Ratner (eds.) *Psycholinguistics Today*. New York: Holt, Rinehart and Winston.

References cited in McLaughlin (1990a)

Dulany, Carlson & Dewey 1984
Krashen 1979
McClelland, Rumelhart & PDP Research Group 1986
McLaughlin 1978
Pinker & Prince 1988
Reber 1976

References cited in Larsen-Freeman (1991)

Ellis 1985
Felix 1985
Rumelhart, McClelland & PDP Research Group 1986
Tarone 1979, 1983
White 1988

References cited in Bialystok (1990a)

Chomsky 1965
Rumelhart & McClelland 1986
Spolsky 1989
Tarone 1988

References cited in Snow (in press)

MacWhinney 1987
Ervin-Tripp 1974
Snow 1990
White 1990

CHAPTER 10

DRAWING FROM NEUROLINGUISTICS

In my perception, the claims about the process of SLA deriving from linguistic and psychological theories analyzed so far have been highly theoretical and speculative in character. A discipline which makes a more practical contribution is neurolinguistics. In fact, the neurosciences constitute presently a fertile research area exploring the cognitive processes involved in SLA. The present chapter presents a neurolinguistic view on the assumption that it is essential to incorporate such findings in order to promote a comprehensive, realistic perspective of the language acquisition process.

The neurolinguistic view adopted in this dissertation will be Paradis' (1985,1987, 1993, in print), for reasons of recency, and for the quantitatively and qualitatively significant empirical evidence that gives support to his view. A crucial notion underlying this view is that of competence and performance, being, in this sense, influenced by Chomsky. According to Paradis (1985:30-1),

> there are good empirical grounds for maintaining the distinction between the notion of competence, or the store of a person's knowledge of his language, and performance, or the access to this knowledge and its use in actual concrete situations.[...] Hence, there is no reason to reject the distinction between competence and performance, provided that one does not use a transformational generative model of competence, but one that is at the same level of abstraction that comprises it.

The level he is speaking of, and that will be developed here, is the neurolinguistic one. The following topics are going to be addressed in this chapter:

The organization of two languages in the brain
Neurofunctional modularity of the systems
Memory systems involved in the acquisition of language
Implicit competence
Explicit knowledge
Evidence for implicit acquisition
Evidence for dissociation between declarative and procedural memory
Maturational constraints on memory systems
Language aspects belonging to procedural and declarative memory
Metalinguistic knowledge
The limbic system

The organization of two languages in the brain

How are the two languages of the bilingual stored and processed in the brain? Are they stored separately, each one as an independent linguistic system, or as a single linguistic system? In order to answer these questions, which actually refer to the notion of competence, several hypotheses have been proposed in the neurolinguistic literature (Paradis 1985:20-3), such as *the extended system hypothesis, the dual system hypothesis, the tri-partite system hypothesis, the bilingual-type-dependent system hypothesis*, and finally, *the subset hypothesis*, proposed by Paradis (ibid). Up to now, there is no clinical evidence that there is only one neurolinguistic competence for both languages, that is, that both languages are subserved by the same neurophysiological substrate (see glossary). Further studies of differential recoveries (see glossary) are needed to show which hypothesis best explains the organization of the languages of the bilingual or the polyglot in the brain. However, presently, the subset hypothesis is the one which best accounts for all the observable data on differential recoveries.

The **subset hypothesis** holds that there is an isolable function known as language, which can be subdivided into as many languages as there are. In the case of the bilingual, there are two languages, each one with its phonology, morphology, syntax and semantic constraints on the lexicon. There is one subset for L1 and another one for L2. But there is also the cognitive store, the level of

mental representations, which is independent, and which is phylogenetically prior.

Thus, Paradis maintains that we have linguistic subsystems within a general cognitive system, which is completely independent from, but interacts with language, because it is assumed that language encodes a pre-existing message there would be no language without a message to encode, but the message may not be encoded at all. The system looks like a succession of sets which are subdivided into smaller sets, and into smaller sets. He compares it to a Russian doll or to an onion. There is always a layer underneath, which is going to be a smaller part than the rest. Each part is necessary to the whole, but does have an independent existence (neurofunctional modularity, see below), because it can be selectively impaired, that is, we do not destroy the system by removing one module. If we remove the phonology, everything else is left. If we remove part of the syntax, the patient becomes agrammatic (see glossary), but the lexicon and the phonology remain.

Despite the fact that the language modules are represented separately, this representation does not imply that they are anatomically (physically) stored separately. They can very well be stored in integrated ways, that is, we can have a mixture of two language modules in the same general area. In fact, there are circuits which subserve one module and the other, or they may be the same circuits, but in different connections, because there is evidence that we can inhibit one connection while the other one is functioning, or vice-versa, as shown by the selective recoveries and other types of non-parallel recoveries (see glossary). This evidence shows that one language is separated from the other, since the patient can recover one language, but not the other. In this way, lesions at different areas will affect selectively one system or parts of each of the systems. Aphasia and dementia (see glossary) are evidence for the existence of

each system. Different amnesias are evidence for the existence of parts within the systems. Both types of evidence will be explained further.

The organization of the systems in the unilingual is identical to that of the bilingual. The unilingual has two stores, the cognitive store and the language store, even though here there is only one language store. It is a question of quantity/degree, not a question of one having something that the other one does not have. In principle, anything that is true for the bilingual is true for the unilingual.

Neurofunctional modularity of the systems

Neurofunctional modularity means that each particular function is subserved by a particular neural circuit which is independent of every other function. And even within other functions of language there is modularity in the sense that morphology, phonology, syntax and lexicon are quite separable, and they are separated by pathology. It is a notion of modularity in the sense of Fodor's (1983), which is also present in the view of Sharwood Smith (1991). Paradis looks at the mind as an organ, the way Fodor said, but where he differs somewhat from Fodor is that he assumes that all these various neurofunctional modules do communicate with each other; in the normal use, these functions are used at the same time, but actually they are not integrated. They are all individual parts, but they all belong to an organism. The analogy is clarifying: if we look at an organism, we will see that our body has different parts, a liver, a heart; each one has a very specific role to play and is a very specific anatomical entity, but if we remove the kidneys, the heart does not work anymore; if we remove the heart, nothing else works. They are all interdependent, but nevertheless separable, each having its separate functions.

The neurofunctional system that subserves language is very real, and in some cases, anatomically very different, so that we have a neuroanatomical module.

But this is not always the case. There are modules that cannot be distinguished anatomically, but that can be distinguished neurofunctionally, because the difference may not be necessarily the locus in the brain, but the particular neurotransmitter which is at play. That is why it is better to say neurofunctional than neuroanatomical, although in many cases it is also neuroanatomical. For instance, language as a whole system is neuroanatomically separable from the rest of cognition. We have language located in several specific areas, which, when they work together, give rise to language. There is a very important area in the frontal lobe, namely Broca's area. A lesion anywhere in this area will cause aphasia, and a different kind of aphasia, depending on the precise location of the the lesion, which shows that even within language we have modules. We can have phonological problems (impairments) without syntactic problems, syntactic problems without phonological problems. This is known as double dissociation.

Double dissociation is the measure of modularity in neurofunctional terms. If we can show a double dissociation between any two functions or sub-parts of the functions, then we must assume there is some kind of neurofunctional independence of each of them. They are dissociated by pathology, but in the normal course of language use, are used together, integratedly. We cannot use our lexicon independently of our phonology or morphology. They are all used together at the same time with our pragmatic knowledge. So, it is not that they are independent to the point that they do not communicate with each other. In fact, they are often integrated into larger units, but separable, as determined by double dissociation.

The difference from Fodor is at this point: Fodor does not assume that the type of mechanism or circuitry which subserves each of these different functions is the same. Paradis also assumes that language is different from any other cognitive function, but this does not mean that the way that the

neurons and the circuits of neurons which are at work are in any way different; it is just that they subserve different functions, but basically using the same type of mechanisms. It is an identical type of processing which leads to different results. For instance, memory is independent of language, but this does not mean that memory works in a different way from language. In the same way, any higher cognitive function (see glossary) is subserved by the same type of mechanism, and each one gives rise to a particular function. They differ in the output, but the way they work is the same. Both language and other higher cognitive functions depend on the same kind of neural tissues that subserve them. Thus, we cannot expect them to behave differently. They behave in a very similar way, except that each subserves its own function. The fact that the system is modular does not mean that the inner working of each module has to be radically different from the inner working of another module. In sum, the very basic notion of modularity is the same, except that it is not applied to circuit mechanisms that subserve these functions.

Memory systems involved in the acquisition of language

Memory is just an abstraction which does not exist by itself. It might be a metaphor or an abstraction built at the theoretical level, but at the neurolinguistic level it does not exist. There is no such thing as general memory, nor as linguistic memory. Actually, if we want to represent memory, we have to assume it is not a unitary faculty, a monolithic function. Memory is a modular system: there are a number of different types of memory (see Fig.1). There are two main types of memory, radically different from each other. **Short-term memory** (STM or **working memory**) and **long-term memory** (LTM). Within LTM there are several different components, in particular, we have **implicit** and **explicit memory**. Implicit memory has eventually been called **procedural memory** and explicit memory has been called **declarative**

memory.. Procedural memory can refer either to **cognitive skills** or **motor skills**. But there are some phenomena which are implicit, and which are not necessarily procedural, such as priming (see glossary). Declarative memory can be **episodic** (memory of events) or **encyclopedic** (memory of concepts).

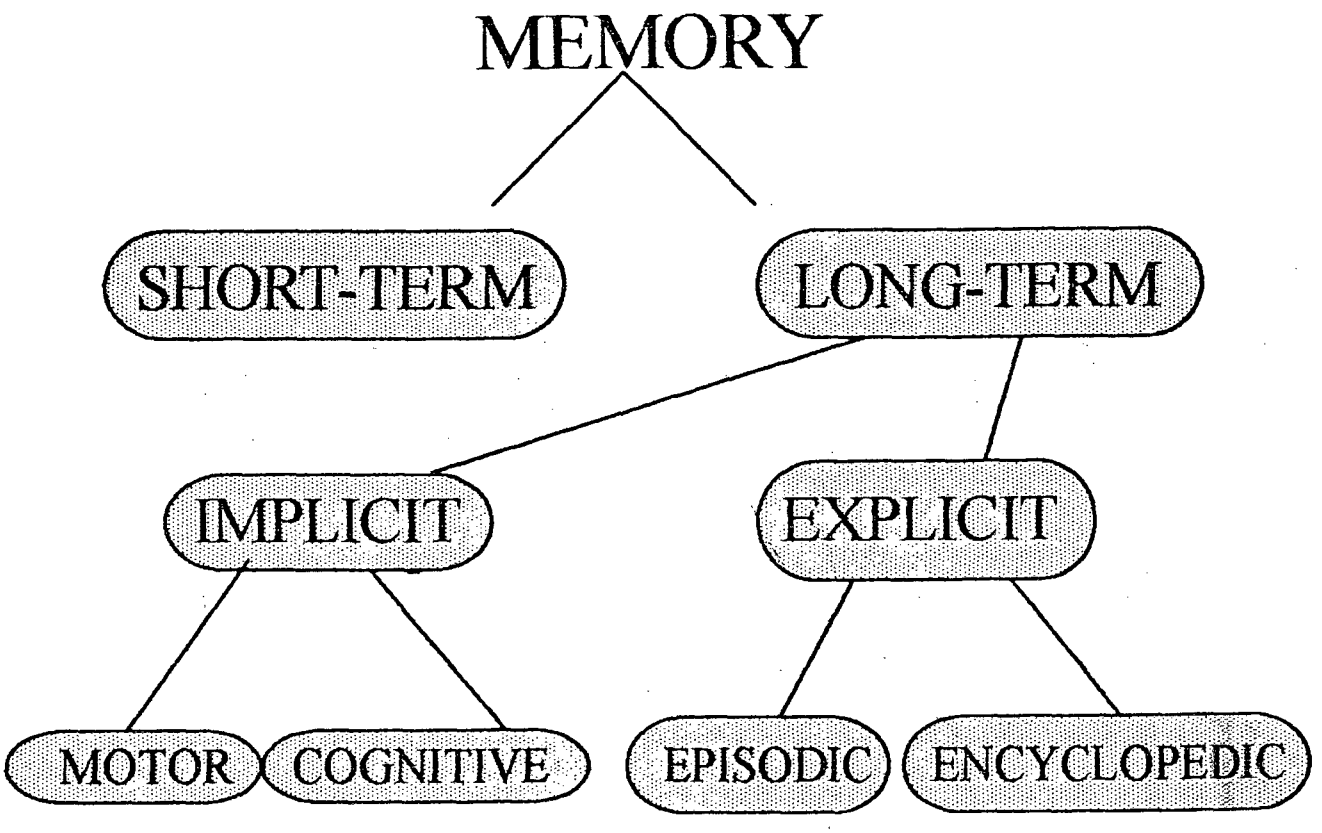


Fig. 1 Types of memory, according to Paradis (1993)

Within motor memory, there is **sensory memory**, that is, our memory for smells and sounds, etc., which can be selectively impaired. We have people with auditory agnosia who cannot recognize the sound of the bell, or of a horn, etc. Of course, this happens in the absence of primary sensory impairment. They hear it, but they cannot interpret what they hear. Still within motor memory, we have what Penfield (in Paradis 1985) called **praxic memory**: knowing how to drive a car, ride a bike, all memory for skills that can be selectively impaired in the cases of apraxia. This is again evidence for a neurofunctional modularity system within memory. In sum, memory is a modular system, because there is double dissociation: it can be selectively impaired. There are the phonological, morphological, syntactic and lexical memories, different types of memories which may be impaired by the selective types of amnesia plus different types of aphasia. We may have two or more of these impairments at the same time, which is a syndrome; but the fact that we can have them in isolation speaks in favor of the existence of each of those particular subsystems.

Implicit competence

Implicit competence (or procedural competence) refers to something we infer (that is why it is called implicit). The behavior of the subject tells us that there must be some competence stored in that person's mind, but we have no direct access to that knowledge. So, we infer that there must be this kind of knowledge, otherwise the individual would not behave in the way that s/he does. This is what Chomsky calls implicit linguistic competence. We do not know in what form the rule is stored -- all we know is that we behave very systematically and that this behavior looks like it is rule-governed, so that we must assume that there is an implicit competence. We have to assume that the child is implementing rules, although it is obvious that s/he has no explicit knowledge of these rules. That is why it is counter-intuitive to talk about knowledge we are

not aware of. Knowledge is what we know, so, how can we not know what we know? So, it is preferable to use competence instead of knowledge. It is what allows us to perform, even though it is opaque to introspection. Neurolinguists say that we have no way of finding out the form of this competence that we have in our mind.

Implicit competence refers to the fact that it subserves a skill. Language as a cognitive process is a skill like any other cognitive skill, and behaves accordingly. The competence that underlies that skill we call procedural, because it is a series of procedures, of which we are not aware, that subserve our performance.

Implicit competence is acquired incidentally , that is, it is acquired by not focusing on what is being acquired. We never acquire procedurally that upon which we focus our attention. It is something else which is being acquired. We focus our attention on something but it is another aspect of that particular item that is acquired. It is stored implicitly, i.e., we do not know its contents, the form of that knowledge, it is opaque to introspection. Nobody knows yet.

Implicit competence is highly inflexible and task-specific. This means that there is a different procedural competence for every function. Knowing how to ride a bike does not help to learn how to drive a car. Speech is a particular type of procedural competence which is independent of every other procedural competence and thus it is not influenced by other procedural competences.

Every implicit competence can be impaired. All we need is for the normal circuit that subserves this particular function to get inhibited, either by pathology or by disuse. This is true of language, in the case of aphasia, or this impairment can be caused by attrition: if we happen to be away from our country and do not speak our language for years, we forget it. That is why **frequency of use** is such an important characteristic of procedural memory, as well as **recency of use**. If procedural competence is not used, it becomes dysfluent, ineffective, stiff or

even extinct. In other words, frequency of use has an effect on performance. As we will see later, this is not true of declarative knowledge.

Implicit competence is used automatically, that is, we are not aware of its mechanisms of use: they are unconscious. We are not conscious of how we put our words together, we do not think consciously how we are going to say what we say. Morphology, phonology, syntax and retrieval of the lexicon are independent modules (we know that they are independent because they can be selectively impaired), which can and do work in parallel. In the course of speech they are integrated, they all have to be activated in parallel. The fact that it is automatic also means that we do not pay attention to what we are doing, therefore, it does not interfere with other automatic functions. Anything that is used automatically does not interfere with any other automatic system. We can perform several tasks which depend on different procedural competences at the same time, like talking while walking, because they are all procedural systems.

Explicit knowledge

Explicit knowledge (or declarative knowledge) refers to that knowledge which we consciously know and which we can talk about. There are two basic types of explicit knowledge, **episodic memory**, as called by Tulving (1972 cited in Paradis 1985), also called memories of episode: memories in which we participated, that is, what we did in the morning, the year before, what we saw, what we heard, all our previous experiences. That is why Penfield (1959 cited in Paradis 1985) has called it experiential memory. We can tell about it, so that it is declarative. The other type is conceptual memory, as Penfield called it, or what linguists very often refer to as **encyclopedic memory**: knowledge of the world. Everything that we have learned: Geography, History, things that are part of our conceptual system

Explicit knowledge is acquired consciously, in opposition to procedural competence. We are aware of the information we are acquiring. It is stored explicitly in the sense that we have access to it. Any content of explicit memory can be recalled by conscious awareness, through introspection.

Explicit knowledge is very flexible. If procedural competence is task-specific, declarative knowledge, in opposition, is very flexible in the sense that it integrates input in all modalities. It does not matter through what kind of input we acquired the information, whether somebody told us, we read or saw it, or in what language it was heard, we store that as declarative memory and we can recall it. Every time we learn something new, it is integrated with previous information, in such a way that we have a lot of interaction between these memories. This integration of new explicit knowledge to previous knowledge is very well explained by Ausubel (1978), in his theory of meaningful learning.

The following chart summarizes the characteristics of both types of memory:

Procedural competence	Declarative knowledge
•is acquired incidentally •is stored implicitly •is used automatically •is not verbalizable •is highly inflexible •is task-specific •frequency of use •recency of use	•is acquired consciously •is stored explicitly •its contents can be recalled to conscious awareness and verbalized •is flexible •integrates input from all modalities

Fig.2 Characteristics of procedural competence and declarative knowledge, based on Paradis (1993).

Evidence for implicit acquisition

1 Children, in getting the meaning across, acquire the form. By focusing on the message, on the pragmatic aspect, the child ends up acquiring the grammar.

2 When learning a new sound, we focus on the acoustic properties of that new sound, but what gets stored in procedural memory is the proprioception of the sound, i.e., the feedback to the brain of how we should place every muscle to pronounce that sound, which allows us to produce it. The brain has an area, the synesthesic area, that feels, in the sense that it carries out a constant monitoring of where every muscle is at any given moment, when we speak or walk. This is the proprioceptor (see glossary). We focus on the result of the action, but that is not what gets stored in procedural memory -- that is episodic -- what gets stored is the proprioception. The declarative, metalinguistic knowledge of how the sound is produced might help the person to practice, but what is going to be stored in procedural memory is not that knowledge, but the proprioceptive feedback, the feedback that the brain gets from the place where any muscle is at any given time.

Another instance is learning to ride a bike. When we explain to someone how to ride a bike, the person internalizes certain rules of how to ride it. S/he might know everything about it, but it is only when the person gets proprioceptive feedback of every muscle involved that s/he will be able to ride the bike.

Evidence for the dissociation between procedural and declarative memory

What kind of evidence do we have for the distinction between declarative and procedural memory? The clearest evidence comes from **amnesia** (see glossary), from patient H.M., who has been studied for the past 40 years. It happened that he had one of his hippocampi removed in order to stop the spreading of epileptic seizures, but they did not know that the other hippocampus was also dysfunctional. As a result, they ended up with a totally anterograde amnesic patient, absolutely unable to acquire new memories. For the last forty years,

that patient has not been able to acquire any new memory. He cannot learn a single new word, nor any new episodic memory (he cannot remember his address, for instance). That shows the difference between his declarative memory, which is completely deteriorated since the operation, and his procedural memory for skills -- he is able to learn new motor skills, like how to use his wheel chair or to play a new piece on the piano that he has never practiced before. His cognitive skills improve with practice in the same way that they do with normals. In all kinds of cognitive tasks, like recognizing a fragmented picture, in which first we see only dots, but eventually we recognize it, or the Tower of Hanoi problem, he shows the same amount of improvement of normals, which shows that episodic memory has been affected, but not his cognitive skills, nor his motor skills. He has no episodic memory of the actual event, but has the benefit of the practice, which is probably unconscious, since he does not remember it.

Further evidence is from the patient (the nurse case, reported by Paradis 1993) who had tremendous word-finding difficulty. She could remember which object she was able to name the day before and which object she was not able to name, but that did not help her retrieve the name on that day. This shows that the language system and the declarative memory system are completely doubly dissociated. It shows the other side of the dissociation, of the amnesic patient, who has lost his ability to acquire new explicit or declarative memories, but has retained the ability to acquire new procedural memories, any cognitive skill.

The evidence from amnesia tells us two things. On one hand, it tells us that implicit and explicit memory are subserved by neurofunctionally distinct systems, since when the hippocampal system is affected we lose our declarative memory, but we still have access to our implicit memory. On the other, it tells us that the lexicon is at least in part subserved by declarative memory, while

morphosyntax is subserved by procedural memory. Since H.M. has never been able to acquire a new word, it seems that this ability is a function of declarative memory. That would be the case for the following reasons. We are at least conscious of the phonological form and of the meaning of the words we learn. For every word, we at least know its meaning and the way it is pronounced. But this is very different from morphosyntax, because we are not conscious of the morphosyntax we use, since nobody up to now knows what it looks like. A three-year-old child is able to produce sound sentences, but s/he does not even know what verbs or nouns or adjectives are. Yet s/he produces them in the right sequence, with the right agreement tense, etc. The child shows evidence of using an implicit morphosyntax of which s/he is not aware. There is a clear dissociation within language between that part of the lexicon which refers to phonological form and meaning and the part which refers to morphosyntax. We do not know consciously, unless we study grammar, whether a verb is transitive or intransitive. So, pronunciation and meaning of the word are known consciously whereas the rest of the lexicon is not. Some additional evidence of that dissociation has to do with the fact that the lexicon (meaning a number of words which have meaning and pronunciation) is also less sensitive to the age at which we acquire the word for the first time in the second language. This is shown by neuropsychological experiments called event-related potentials ([ERP] Paradis, in print). We place electrodes on the scalp of the subject and we monitor the electrical activity over the various areas of the brain; we then notice that there is an area which is involved in the processing of words (i.e., lexical items), and a different area which is involved in the processing of morphosyntactic aspects, including function words. They are processed in a particular way as shown by these experiments. There is no difference in the processing of lexical items whether we learn a second language in age 2, 3, 10 or 45, but there is a difference with respect to the way function words are

acquired. There is anecdotal evidence that it is possible to acquire a very large vocabulary no matter when we start learning the language. People who have learned late tend to have problems with the phonology and with morphosyntax, but they acquire a large lexicon. A study in Britain (Conrad 1979 cited in Paradis [in print]) has shown, for instance, that deaf children who learn English late can acquire a very large lexicon, but remain impaired in the use of English grammar. There is this large body of evidence that comes from different directions, showing that lexical items behave differently from the rest of language, that is, from phonology and morphosyntax. This is also further evidence for critical periods. We are not talking about a critical period, but of a continuum which goes from age 2 to age 92 in which language gets more and more difficult to acquire as one gets older. There is no such thing as an absolute cut-off point, but if we acquire our second language later in life, we are going to show a different pattern of organization of our morphosyntax and of our function words. They will not behave in the same way as they do in unilinguals or in bilinguals who have learned their language early in life.

Besides clinical evidence, there is also neuroanatomical evidence for the dissociation and evidence from anesthesia. These are highly technical types of evidence which are not going to be developed here, but which can be found in Paradis (in print).

Maturational constraints on memory systems

All the evidence converges to show that the later the second language is acquired, the more different it is organized in the brain, as shown by function words. There is very strong psychological evidence for a difference between acquiring a first language and acquiring a second language later in life, at least with respect to morphosyntax, phonology and function words, but less true, however, for the acquisition of vocabulary.

The capacity for acquiring procedures incidentally decreases with age. This is true not only for language, but for any procedure. The procedural aspect for speech is the same; the declarative aspect might be maintained full with age. In fact, when we look at procedural memory and declarative memory, it seems that procedural memory is much more fundamental, it is prior phylogenetically and ontogenetically, in the sense that animals show a lot of procedural memory and they have very little declarative memory, if any. Besides, children have procedural memory long before they acquire declarative memory. This is probably why we cannot remember anything before the age of 3 or 4.

Declarative memory seems to be a characteristic of the most advanced species. The declarative aspect of speech does not decrease with age. It improves with age, and so does the ability to store metalinguistically.

Language aspects belonging to procedural and declarative memory

Concerning the **lexicon**, there are two aspects that should be considered. First, its acquisition; second, its use. With respect to its acquisition, part of the lexicon, namely, the phonological form of the words and their meaning, is declarative, we are aware of it, it is acquired consciously. The anatomical evidence we have is patient H.M. and other amnesic patients, who have difficulty in learning new words. As to function words, since they are a closed class, it seems that they are subserved by distinct neural systems, that is, they are acquired procedurally and thus are susceptible to maturational constraints (Neville 1992 cited in Paradis [in print]). There is no difference in the organization of the lexicon (that part of the lexicon which is declarative) in first language learners and SL learners -- there is no correlation between age of learning and the representation of the lexicon.

An interesting aspect of the storage of words at the neurolinguistic level is that they are not stored as words, but as a matrix of features. Their meanings are multi-sensory engrams (see glossary), that is, memory traces of previous experiences that are perceived in a multi-sensorial way: they are connected to audition, vision, to taste, to smell, to feeling. The engrams do not presuppose a biochemical, electrical or anatomical base, they are just memory traces left that form our mental representations or meanings.

With respect to the use of the lexicon, it is an aspect which is implicit, in the sense that we are not conscious of how we access the vocabulary and how it is integrated in the microgenesis of the sentence, when everything 'falls into place', the syntactic frame, the phonology, the morphology, in sum, the production realization is held outside awareness.

Phonemes are surely not declarative -- children are not aware of them until they learn to read in alphabetical systems. There might be awareness of vowels, because they constitute the syllables.

Morphosyntax is acquired procedurally, like function words. It sorts out different areas of the brain active, according to whether we learn the second language later or early in life. Thus, it is subject to maturational constraints (Neville 1992 cited in Paradis [in print]).

Pragmatics is not stored with the language (following the Chomskyan division of grammar), it is stored separately, in the right hemisphere. Lesions in the language areas in the left hemisphere cause aphasia, whereas lesions in the language area in the right hemisphere do not cause aphasia, but cause pragmatic problems. The patient does not have morphological, phonological, lexical, or syntactic problems, but does have pragmatic problems, that is, problems with any type of inference from context, general knowledge, discourse, anything that is unsaid and must be inferred. Both hemispheres are

absolutely essential for normal communication, but those who have the pragmatics impaired have a much more difficult social life.

In brief, if we have learned the second language early in life, there is no difference between the organization of the first and the second language. If we have learned the second language later, there is a difference -- probably it is stored declaratively and used less automatically. There is evidence of differential organization of morphosyntax and function words in early and late SLA.

Metalinguistic knowledge

Is metalinguistic knowledge (MK) gradually automatized so as to become implicit? This is one of the key-questions of this study, and there is no doubt that the insights revealed by neurolinguistics are crucial to the study.

MK is different in kind, in contents, and is subserved by different neural circuits if compared to the knowledge we have been dealing with up to now, namely, knowledge resulting from linguistic competence.

What does it mean to be different in **contents**? MK is a kind of declarative memory, because it is knowledge we are conscious of (that is why we call it *knowledge*) whereas linguistic procedural competence is implicit and unconscious (that is why we call it *competence* , because it can only be inferred from behavior, it can never be inspected, introspected). The first kind of evidence that MK is declarative is that there is evidence of procedural competence without any MK, namely, a 4 or 5 year-old child who speaks the language and has absolutely no notion of grammar. S/He acquires the whole system, rather than learns it, without even being aware of the fact that s/he has a system in her/his mind.

The second kind of evidence pointed out by Paradis (1993) comes from the experience of anyone who has taught a second language or who has taught the native language as a second language. The first time a student asks, 'Why do you

use the subjunctive here?' we do not know the answer. We have been using the subjunctive for our whole life, but it would be surprising if we knew why. We quickly make up an explanation. Then we go home, open a grammar, and realize that it is only partly true. There are many more rules to explain it than we could suppose. We do not know that in an explicit way, in the sense of declarative knowledge, yet, we have this implicit linguistic competence. This is a case of having procedural competence without declarative knowledge. The reverse is also true and can be found in any SL classroom. People who learn a second language in school with a grammar-translation deductive method learn all kinds of rules, a given vocabulary, but are not able to produce sentences, to create them. What they have is MK, rather than an implicit linguistic competence.

MK is one source of knowledge that we have about both our first and second languages if we have been to school. The MK of our first language will be proportional to the degree of schooling that we have, which means that different people speaking the same language will have different levels of MK. This has an important implication for the recovery of aphasic patients. Aphasic patients who have lost access to their procedural system have nevertheless access to their declarative system, which means that even though they cannot speak automatically anymore, they cannot use their competence anymore, they can still produce sentences in a controlled way, by consciously applying rules they have learned and stored as declarative knowledge. This is probably why it has been observed that the more educated the patient, the better the prognostic of recovery. This is not really recovery of procedural memory, but it is the ability to speak by using MK. Also, it might explain the paradoxical recovery of a second less well known language over the native language in some patients. They have lost access to their linguistic competence of both languages, but since they have learned the second language at school very formally and thus have a good

amount of MK, they can use that to perform in the second language. Obviously, they are slow and do it in a very reflective way, but that is usual in aphasic patients.

What does it mean to be different in kind? It means that the pedagogical rule we learned is not what we use when we speak using our linguistic competence. Our linguistic competence allows us to speak at a speed of up to 14 phonemes per second, integrating the search for lexical items, the phonological rules, the syntactic framework, etc., so that in milliseconds we manage to produce a sound sentence, not really knowing how we did it.

Another example comes from phonology, as mentioned before: when we learn a new sound, what we store in declarative memory is the description of the sound, the acoustic properties of the target sound, which is a different type of knowledge from that which allows us to produce the sound. What we store in the brain is the proprioception of the sound, the sense of where every muscle is at any second. That is stored as a kinesthetic program (see glossary), which can be used automatically to produce the sound. What is stored is kinesthetic; what is focused on is acoustic. They are different entities; one does not become the other; they differ in kind and in contents. In one case, it is a pedagogical rule, in the other case, it is whatever linguistic competence allows us to do.

In order for declarative knowledge to be used, we have to focus our attention on that piece of knowledge. This is very different from procedural memory -- any kind of procedural competence can be used automatically, which means that we can use two or three automatic processes at the same time, but we can only concentrate our attention, our conscious awareness, on one thing at a time, because attention is selective. Either we concentrate on the pronunciation of the word, on the morphological form of it, or on the agreement of this word, but we cannot work out at the same time the syntactic

frame, the morphological agreement, the selection of lexical items, and the phonological rule. It is impossible to integrate all of that at the same time consciously, if we had to concentrate on each process at a time, then it would take much more time (much more time than conversational speed), we would have to create it in our head, and the processing would be serial, which is not the case, language processing works in parallel.

The limbic system

Humans have a brain that contains a huge amount of neocortex, which animals have in a much more limited quantity, and which are the most evolved structures. But they share with animals a less evolved structure, the brain stem, which is specialized for sensorimotor processes, reflex-like type of things, and a limbic system (LS), responsible for emotions, drives, motivations. Humans' emotions, motivations do have an impact on how they process things at a higher cognitive level in their neocortex. Phylogenetically and ontogenetically there is a communication system that exists long before language is acquired -- most animals communicate through the limbic system and so does the child. When a child opens her/his mouth to say something, it is because s/he wants to get a meaning across, and this drive to say something is a function of the limbic system. It continues to be present later on, so that every act of communication is based on some limbic participation. In 1977, Lamendella pointed out the various limbic areas that are active at different times during the ontogenesis of the child. He also pointed out that we have various functional subsystems, each providing its own contribution to the communicative function. They continue to contribute, once language is acquired. Lamendella stresses that every limbic subsystem continues to exert control over these functions. Every utterance is limbically-based, that is, has an intention to communicate as its basis. This intention focuses the attention of the individual on the message

being communicated, rather than on its form, which is the best way to develop implicit linguistic competence. It is exactly this involvement of the limbic system, so important for the acquisition of linguistic competence, that has been missing in all of the teaching methods and approaches so far, with the exception perhaps of the communicative approach, which relies crucially on motivation.

Summary

We assume that language is a cognitive skill because it shares all the characteristics of cognitive skills: it is acquired incidentally, stored implicitly, used automatically, and so on. It is similar to other cognitive skills, like learning to recognize faces, directions, the dot problem, tower of Hanoi.

As to the organization of language, there are the L1 and the L2, each with its subsystems, and the cognitive system. These systems are all subserved by different memory traces, and they all work along the same principles. They form a neurofunctional module which is subdivided into smaller parts. These parts are separable but related. They can communicate with each other. Even though we have functions that are quite different, that are subserved by different neuroanatomical or neurofunctional loci, they nevertheless are based on the same basic principles, because the brain works in fundamentally similar ways.

Implicit competence is called implicit because we infer its existence from the actual behavior of the subject. The characteristic of procedural competence is that its acquisition occurs by focusing on something different from what is stored. It is stored implicitly in the sense that we cannot have access to it; it is used automatically in the sense that we do not consciously control what we are doing.

Explicit knowledge is acquired consciously, stored explicitly, so that its contents can be recalled to conscious awareness and verbalized. It is flexible, that is, it integrates input from all modalities.

Explicit and implicit knowledge are dissociated. We realize that they are doubly dissociated when we look at aphasic patients who indeed have language problems but do not have explicit memory problems.

Conclusion

There are different levels of representation that are involved in the subject of language, and which are often misunderstood: the linguistic, the psycholinguistic, and the neurolinguistic levels. In fact, they are completely independent systems, that do not have any relation to each other. If we talk of language competence at the linguistic level, it has a completely different meaning than if we talk about that at the psycho or neurolinguistic level. But, as mentioned in the introduction of this chapter, we can use a linguistic notion, such as the notion of competence, provided that we adapt that notion to the level at use, as Paradis does. But this must be very clear, very precisely done, otherwise, we will end up with a great miscellanea of concepts, and highly controversial, misleading theories.

One common misunderstanding regarding the levels has to do with the modularity of language. Because language is described separately at the linguistic level, this does not mean that it is separated at the neurological level. At the neurological level, we have functions/modules that work independently from each other, showing modularity among them, but neuroanatomically, we might find linguistic functions mixed in a same area. When at use, however, these functions are integrated, they form a whole named LANGUAGE.

Chomsky's claim of implicit competence is at the linguistic level. It is just an attempt to describe the grammar that accounts for verbal behavior of native speakers. By no means is this the form that is stored in the brain.

In the 70's, many psycholinguists tried to look for the so called psychological reality of these constructs. They never found them. But Chomsky never claimed that his constructs had psychological reality. We cannot blame Chomsky for the fact that others were not able to find neuro or psycholinguistic conformation of his constructs. He only postulated a refined description of how the system works -- as a theoretical system. It is a purely theoretical system that intended to be complete enough to account for the actual production and circumstances of production.

What Paradis calls implicit linguistic competence is what we may infer (as Chomsky does) that we have at a neurolinguistic level. The form of this competence, precisely because it is implicit, is not known, and it is very unlikely to be any of the successive descriptions that Chomsky or any other linguist have created. It is of paramount importance to understand that Paradis is not claiming to know the internal organization of our neurolinguistic competence, but only its existence at a neurological level. Its organization, he says, we cannot know, otherwise it would not be implicit anymore.

Neurolinguists are strong in their criticism of the works of linguists like Chomsky and his colleagues, specially when we consider that they have tried to characterize linguistic competence for the past 25 years or more, every so often coming up with an entirely different way of describing it (the structuralist, functionalist, generativist, and within them, different ones). For the neurolinguist, this is evidence that we are not aware of what we have in our mind, that we do not know the form of the grammar that we have, if indeed we have a grammar in our mind.

But having in mind that neurolinguistics is a science in which empirical evidence is not taken to prove theory x, y or z right, but in which the data speak for themselves, at least two things can be assumed: 1 we do not know, by performance evidence, the form of this competence system; 2 we surely acquire and use it unconsciously. What we know is that the competence system allows us to behave in a systematic way. It might be described in terms of a generative grammar, or some other type of grammar, but it might also be a statistical system. It might be a system parallel distributed processing, where things get activated in the presence of stimuli. But the result is that we speak in correct sentences. It is like the proprioception, like the engrams, we have to assume they are there, but we do not know what they look like. That is how the brain processes language: we have absolutely no access to it.

REFERENCES

Ausubel, D., J. Novak & H. Hanesian. 1978. *Educational Psychology: A Cognitive View*. New York:Holt, Rinehart and Winston.

Fodor, J. 1983. *The Modularity of Mind*. Cambridge, MA:MIT Press.

Lamendella, J. 1977. General principles of neurofunctional organization and their manifestation in primary and secondary language acquisition. *Language Learning* 27:155-96.

Paradis, M. 1985. On the representation of two languages in one brain. *Language Sciences* 7(1): 1-39.

Paradis, M. 1987. Neurolinguistic perspectives on bilingualism. In *The Assessment of Bilingual Aphasia*. Hillsdale, New Jersey:Lawrence Earlbaum Associates.

Paradis, M. 1993. *The Organization of Two Languages in One Brain*. Lectures given at the ISAPL -- International Seminar on Psycholinguistics, Federal University of Santa Catarina, Florianopolis, Brazil, 4-15 January.

Paradis, M. In print. Neurolinguistic aspects of implicit and explicit memory: implications for bilingualism. In N. Ellis(ed.) *Implicit and Explicit Language Learning*.

Sharwood Smith, M. 1991. Language modules and bilingual processing. In E. Bialystok (ed.) *Language Processing in Bilingual Children*. Cambridge:CUP.

CHAPTER 11

CONCLUDING REMARKS

Similarly to memory, learning is an abstraction. There is no mental entity known as learning, at least not a single one. Learning is a collection of cognitive tasks or processes that lead to the modification of one's knowledge base or cognitive structure. These processes may take place consciously or unconsciously. Some instances of those tasks are linked to perception (attending or abstracting), encoding: storing in STM, storing in LTM, retrieving, or rehearsing. The most complex type of modification of the cognitive structure, namely, restructuring, can be found in the learning of language.

In fact, restructuring is not a common or easily observable process involved in learning. It has not been extensively studied yet, perhaps because the access we have to the organization of memory and creation of cognitive structure is limited to the observation of production. What adds to the research of this topic are studies on incidental or implicit learning, problem-solving, meaningful learning, discovery learning, in sum, types of learning processes that might lead to procedural competence in opposition to declarative knowledge. But the crucial question is: what makes one store things in procedural and NOT declarative memory and thus use different learning processes, different memory systems? McLaughlin (1986:122) approaches this issue when he asks:

> Are there, for example, certain conditions that lead learners to be more (or less) ready to restructure?

It seems that the answer lies in the notion of cognitive prerequisites, as Pienemann proposes, cognitive prerequisites specific to language, I would say. It is as if there were stages of language development, something akin to Piaget's stages, but specific to language, not applying to general cognitive development.

Perhaps such stages are linked to Universal Grammar, perhaps something like UG exists at a psychological level, not only at the linguistic level, because at the linguistic level we cannot or should not expect psychological realities, but metaphors, abstractions. In any case, what I mean is some kind of language constraints independent of the rest of cognition but nonetheless determined by it. This is possible, because language matures at its own pace, it does not follow other cognitive abilities, although it is related to them somehow. Language can either develop or be impaired separately from the rest of cognition, which speaks in favor of a specific language cognition, as shown by the case of Genie, the wild girl studied by Curtiss, and by all the selective impairments -- amnesias and aphasias -- reported by neurolinguistic research.

Another possibility that determines which type of memory shall be used and consequently which type of knowledge or competence shall be produced is certainly related to meaningfulness, to the involvement of the limbic system in the task being performed. Neurolinguistics calls limbically-based tasks those which have a deep involvement with the desire to communicate, to express something emotionally-rooted. Lamendella was the one who unfolded this and Paradis reminds us that there is no procedural competence if this deep involvement of the limbic system is not present. Concerning that, we must acknowledge Krashen's insights, which were so intuitively right. His notion of comprehensible input expresses precisely that notion, that the input must be relevant, meaningful, and comprehensible, adjusted to the level of the learner. It is comparable to Ausubel's notion of meaningful learning, the type of learning that produces the highest level of retention possible.

Perhaps a realistic picture of how acquisition/learning takes place can be obtaining by joining both Pienemann and Seliger's view with Sharwood-Smith's (having in mind that this last one is a follower of Fodor). From this set of insights, it results that areas that have not undergone a critical period are those

in which acquisition (procedural knowledge) can still take place, i.e., a linguistic, language-specific module of cognition is used, and successfully. It produces 'acquired knowledge'. Now, areas of language which have undergone a critical period cannot benefit from the linguistic module, but only from the general module (following Sharwood-Smith's frame), that is, the meta-mode. In turn, encyclopedic learning takes place via practice, getting the most from formal instruction. The result is 'learned' knowledge, which is a type that has to be rehearsed in order to be stored. It is basically the same view held by Paradis', with some differences in terminology, but following the same basic principles. The notion of modularity, very central to both views (Paradis' and Sharwood-Smith's) is somewhat different in each, but its core is the same.

The central difference between the linguistic view of Fodor and Chomsky and the neurolinguistic view is that grammars produced by linguists are 'real mental entities' to them, while to the neurolinguist they are but abstract hypothetical attempts to describe the way in which linguistic information is organized. Neurolinguists claim that we do not even know whether the linguistic information is organized in the form of rules, let alone in the form of grammar. They say that it might very well be in the form of a network of connections strengthened and weakened by the environment, as has been proposed recently. Furthermore, the neurolinguist says that we will never be able to find out how our competence system is, because we can only infer from data produced by the speaker, which does not really give us a picture of it.

Psychologically-oriented theories, as I called them, provide us just with a brief account of unconscious processes. In fact, it is linguistic theories that rely on the workings of the unconscious, claiming the existence of entities such as UG, LAD, natural route, cognitive prerequisites. There is no doubt that these entities provide powerful explanations for the idiosyncrasies of the language learning process. However, they are hardly explained in depth by the linguist, letting

subjectiveness and vagueness permeate the theories and consequently the field. Realistically speaking, the 'black box' puzzle remains unsolved if we count on linguistic theories to explain it. As for theories that rely on Psychology, they all seem to equate the acquisition of linguistic knowledge to the acquisition of general knowledge, ignoring, thus, the language specificity feature, which is so convincingly evidenced by the pathological data in neurolinguistic research. And by equalizing linguistic knowledge with general knowledge they are suggesting that all knowledge is declarative and thus conscious, which is not the case. For that reason, psychological theories provide an even weaker account of unconscious processes, although they do explain how conscious processes occur. The state of the art being so, I call for a multi-disciplinary study of the unconscious, relying on the so called Cognitive Sciences. An issue that deserves further study, in my view, is found in a sub-area of psychology, namely, perception. It is the study of pre-attentive processes, or processes that take place before information is encoded in STM, which encompasses implicit storage of information, which does not require attention to be encoded. This might clear up linguistic questions such as why we abstract some linguistic structures at the expense of others in the process of acquiring a language.

Pedagogical implications

It is not the objective of this study to offer teaching procedures to be implemented in the classroom. While a theoretical study, its purpose is to provide theoretical background to the second language researcher and teacher. Teachers who lack such a theoretical background run the risk of following blindly trends and methods that are fashionable, but that in fact are the dictates of others. Those teachers cannot say where the methods they use emerge from, what they aim at and what they shall produce in the learner. But irrespective of their awareness (or lack of it) of the theoretical backgrounds that permeate what

they use in the classroom, such backgrounds do exist, and they do influence their teaching and their learners' learning.

I believe that the bridge between the theorizing provided by this study and the teaching procedures should be built by the applied linguist. Neither the psychologist, nor the linguist or the neurolinguist are able to, or interested in the pedagogical implementation. They are interested in the issues of language and learning, as abstract, hidden entities to be unfolded. The applied linguist, on the other hand, is the classroom researcher and as such the mediator between the second language teacher and research. It is for the applied linguist, as well as for the conscious second language teacher, that this study is designed.

Suggested theoretical issues to be implemented by the applied linguist are the notions of contextualized practice and comprehensible input, for example. Concerning the first one, having in mind that procedural competence is built whenever the focus of attention is not on what is being learned, any activity that provides focus on meaning can be a useful procedure, be it in the form of task, or of communicative practice. The important thing is that practice must be contextualized, meaningful. As to comprehensible input, it must be specified what it should consist of in order to be relevant, and the best way to adjust it to the level of the learner. For now, what we know is that comprehensible input is responsible for maintaining the learner's mind absorbed in something that is not the language being acquired, but that is given to the learner in the form of this language.

All in all, what can be concluded from this study is that we, second language researchers and teachers, do not have to wander about trends that are to tell us how a second language is best taught or whether we should teach metalinguistic knowledge to produce effective learning. We now know that there are distinct ways of building linguistic knowledge and metalinguistic knowledge and that the efficiency of teaching and of learning will depend on which type of knowledge we want our students to develop.

GLOSSARY

Acquisition - process of meaningful learning, in which structures or concepts are abstracted, picked up, grasped, extracted, or induced unconsciously through exposure to meaningful input, and stored procedurally.

Agnosia - inability to recognize things (concepts and objects) because of loss in sensory perception. (Rothenberg & Chapman 1989)

Amnesia - loss of episodic or semantic memory. Anterograde amnesia is the inability to acquire new memories. Retrograde amnesia is the loss of memories prior to the trauma. (Paradis 1993)

Analysis - to segment the stream of acoustic signals into constituent units and to bring the latter into line with the parallel information on concurrent events which constitutes the situational context of the utterance. (Klein 1986)

Aphasia - the inability to use language because of a brain lesion. (Paradis 1993)

Apraxia - loss of volunteer movements. (Paradis 1993)

Auditorial Agnosia - inability to recognize sounds in the absence of primary hearing impairment. (Paradis 1993)

Broca's area - area of the cerebral cortex involved in speech production. (Rothenberg & Chapman 1989)

Closed class - a group of words consisting of relatively few words, and new words are not usually added to them. Function words are a closed class of words, which have little meaning on their own, but which show grammatical relationships in and between sentences. Conjunctions, prepositions, articles are function words.(Richards, Platt & Weber 1985)

Cognitive process - any mental process which learners make use of in language learning. (Richards, Platt & Weber 1985)
Conceito-chave em Lingüística Aplicada (Educacional) e em Psicologia Cognitiva. Pode significar: (1) uma ação ou operação contínua, específica, dirigida a um objetivo ou (2) uma série de etapas interdependentes por meio das quais atinge-se um objetivo. (Crystal 1980 cited in Gomes de Matos 1983)

Cognitive psychology - a branch of psychology that deals with the nature and learning of systems of knowledge, particularly those processes involved in thought, perception, comprehension, memory and learning. (Richards, Platt & Weber 1985)

A discipline concerned with finding scientific means for studying the mental processes involved in the acquisition and application of knowledge. (McLaughlin 1990)
Ramo da Psicologia que estuda a cognição, i.e., a aquisição, organização e usos do conhecimento. (Neisser 1976 cited in Gomes de Matos 1983)

Cognitive system - a system of knowledge and belief that develops in early childhood and that interacts with many other factors (environment) to produce behavior. (Chomsky 1972)

Cognitive structure - the total content and organization of a given individual's knowledge. (Ausubel 1978)

Comprehension - the process by which a person understands the meaning of written or spoken language. ((Richards, Platt & Weber 1985)

Consciousness - a limited capacity mechanism involved in short-term memory, or what is remembered after internal processing. (Ericsson & Simon 1980 cited in Seliger 1983)

Consciousness-raising - Consciousness-raising, like knowledge about language (KAL) and language awareness, is drawing attention, during the process of language learning, to aspects of the nature and functions of language. Proponents of greater language awareness argue that more explicit and conscious attention to the systematic organization of language is a prerequisite for success in language learning. (Carter 1993)

Cortex - outer covering of the brain. (Rothenberg & Chapman 1989)

Creative construction - the process through which the child constructs a grammar of the native language based on the degenerate input s/he has access. It is possible due to UG principles. (Chomsky 1980). Dulay, Burt & Krashen (1982) applied it to SLA, being known as the 'creative constructionists' (Sharwood Smith 1986).

Deduction - Reasoning that begins with a specific set of assumptions and attempts to draw conclusions and derive theorems from them. (Reber 1985)

Dementia - progressive state of mental decline, esp. of memory function (anterograde and/or retrograde amnesia) and judgment. (Rothenberg & Chapman 1989)

Differential recoveries - when one language is recovered better than the other, after an impairment. (Paradis 1987)

Engram - padrão neuronal de um ato de habilidade adquirida por aprendizagem (sedimento mnêmico inconsciente ou latente de qualquer experiência). (Campbell 1986)

Grammatical or linguistic competence - the cognitive state that encompasses all those aspects of form and meaning and their relation, including underlying structures that enter into that relation. (Chomsky 1980)

Heuristics - processes of conscious or unconscious inquiry or discovery. (Richards, Platt & Weber 1985) E.g., simplification, generalization, imitation, avoidance, Slobin's operating principles.

Higher cognitive functions - are those which are higher than just modality-specific. Language is one of these functions, language is not dependent on the primary auditory cortex. We still use language if we are deaf. (Paradis 1993)

Hypothesis-testing - relying on external feedback (positive or negative evidence) to check hypotheses.

Implicit learning - learning that is not overt, in the sense that is not open to introspection.
Learning of complex materials that is characterized by an eventual knowing of a rich abstract rule system that itself is not the conscious focus of the learner. Implicit learning produces unconscious or tacit knowledge. (Reber 1985)

Incidental learning - in the case of language, learning that happens as a by-product of trying to communicate.
Learning that takes place in the absence of intent to learn or instructions to that effect. (Reber 1985)

Induction - A process of reasoning in which general principles are inferred from specific cases. (Reber 1985)

Information-processing - a general term for the processes by which meanings are identified and understood in communication, the process by which information and meaning are stored , organized, and retrieved from memory, and the different kinds of decoding which take place during reading or listening. It includes the study of memory, decoding, hypothesis-testing and cognitive processes. (Richards, Platt & Weber 1985)

Kinesthesia - perception of body position and movement. (Rothenberg & Chapman 1989)

Modular cognitive systems - cognitive systems that are domain-specific (in the sense that the mind is structured into functionally distinguishable sub-systems), innately specified, hardwired (in the sense of being associated with specific, localized, and elaborately structured neural systems), autonomous (in the sense of not sharing horizontal resources [of memory, attention, or whatever] with other cognitive systems, and not assembled (in the sense of not having been put together from some stock of more elementary subprocesses). (Fodor 1983)

Neurotransmitter - chemical that affects or modifies the transmission of an impulse across a synapse between a nerve and a muscle. (Rothenberg & Chapman 1989)

Ontogenesis - the development or course of development of an individual organism. (Webster 1980)
Ontogenesis of grammar - the development of communication in the child in real time. (Paradis 1993)

Performance - the actualization of competence.

Philogenesis - the evolution of a genetically related group of organisms as distinguished from the development of the individual organism. (Webster 1980)

Physiological - normal chemical and physical functioning of living organisms. (Rothenberg & Chapman 1989)

Plasticity - the ability of brain tissue to subsume functions normally carried out by other tissue. (Reber 1985)

Priming - the triggering of specific memories by a particular cue. (Reber 1985) E.g. the word *doctor* primes us to recognize *nurse* as being a real word. (Paradis 1993)

Production - processo de planejamento e execução do ato lingüístico . (Crystal 1980 cited in Gomes de Matos 1983)

Proprioceptor - sensory nerve ending located in muscles, tendons and other organs, that responds to internal stimuli regarding body position and movement. (Rothenberg & Chapman 1989)

Selective recoveries - when one of the languages is not recovered and remains forever unavailable after an impairment. (Paradis 1987)

Slobin's operating principles - universals in the ontogenesis of grammar, as observed by Slobin (1973). They are: 'Pay attention to the ends of words'; 'Pay attention to the order of words and morphemes'; 'Avoid interruption and rearrangement of linguistic units'; 'The use of grammatical markers should make semantic sense'; 'The phonological forms of words can be systematically modified'; 'Avoid exceptions'; and 'Underlying semantic relations should be marked overtly and clearly'.

Subconscious - information that is not part of one's momentary awareness but which can, given the proper circumstances, be made conscious; information or stimuli that are at the margins of attention, events that one is only vaguely aware of. It should not, in any circumstance, be used as a synonym for *unconscious*. (Reber 1985)

Substrate - the layer or structure lying underneath. (Webster 1980)

Tacit knowledge - unconscious knowledge, which cannot be verbalized. (Reber 1985)

Tower of Hanoi - a neuropsychological test to evaluate general cognitive abilities, in which the patient is given a board with three sticks; on the first stick we have a sortment of circles of different sizes and colors, forming a pyramid. The patient has to move them until s/he forms the same pyramid at the other end. (Paradis 1993)

Unconscious - the general notion is a level of mind lacking in awareness. Specifically, it refers to those internal processes (i.e. cognitive processes) that proceed in an implicit manner outside of consciousness [but not physiological processes]. Unconscious cognitive process is any process involving thinking, reasoning, judging, problem solving, etc. which takes place without consciousness, without awareness. (Reber 1985)

Universal Grammar - the system of invariant underlying principles of linguistic organization. (Chomsky 1972)
The language faculty of mind; [it is] concerned with the acquisition of highly abstract and complex principles and parameters of core grammar via the poverty-of-the-stimulus argument. (Cook 1993)

BIBLIOGRAPHY

Anderson, J. 1983. *The Architecture of Cognition*. Cambridge, Mass:Harvard University Press.

Ausubel, D., J. Novak & H. Hanesian. 1978. *Educational Psychology: A Cognitive View*. New York:Holt, Rinehart and Winston.

Bialystok, E. 1978. A theoretical model of second language learning. *Language Learning* 28: 69-83.

Bialystok, E. 1990a. The competence of processing: classifying theories of SLA. *TESOL Quarterly* 24(4): 635-48.

Bialystok, E. 1990b. Language acquisition and language processing. In *Communication Strategies. A Psychological Analysis of Second Language Use*. Cambridge, MA:Basil Blackwell.

Bialystok, E. (ed.) 1991a. *Language Processing in Bilingual Children*. Cambridge: CUP.

Bialystok, E. 1991b. Achieving proficiency in a second language: a processing description. In Phillipson, R., E. Kellerman, L. Selinker, M. Sharwood Smith, M. Swain (eds.). *Foreign/Second Language Pedagogy Research*. Clevedon:Multilingual Matters.

Bialystok, E. & M. Sharwood Smith. 1985. Interlanguage is not a state of mind: An evaluation of the construct for second-language acquisition. *Applied Linguistics* 6(2):101-17.

Bley-Vroman, R. 1986. Hypothesis testing in second-language acquisition theory. *Language Learning* 36(3):353-75.

Bowers, K.S. & D. Meichenbaum (eds.) 1984. *The Unconscious Reconsidered*. New York:Wiley.

Campbell, R. 1986. *Dicionário de Psiquatria*. São Paulo:Martins Fontes.

Carston, R. 1988. Language and cognition. In F. J. Newmeyer (ed.) *Language: Psychological and Biological Aspects. Vol. 3 Linguistics: The Cambridge Survey*. Cambridge:CUP. 38-68.

Carter, R. 1993. *Introducing Applied Linguistics*. London:Penguin.

Cheng, P. 1985. Restructuring versus automaticity: alternative accounts of skill acquisition. *Psychological Review* 92:214-23.

Chomsky, N. 1972. *Language and Mind. Enlarged Edition*. New York:Harcourt Brace Jovanovich. 1st ed. 1968.

Chomsky, N. 1975. *Reflections on Language*. New York:Pantheon Books.

Chomsky, N. 1980. *Rules and Representations*. New York:Columbia UP.

Cohen, A. 1987. Using verbal reports in research on language learning. In C. Faerch and G. Kasper (eds.).

Cook, V. 1993. *Linguistics and Second Language Acquisition*. London: MacMillan Press.

Corder, S. 1967. The significance of learners' errors. *International Review of Applied Linguistics* V:161-9.

Dechert, H. W. 1987. Analyzing language processing through verbal protocols. In C. Faerch and G. Kasper (eds.).

Dulay, H., M. Burt, & S. Krashen. 1982. *Language Two*. New York:OUP.

Ellis, R. 1985. *Understanding Second Language Acquisition*. Oxford: OUP.

Faerch, C. and G. Kasper (eds.). 1987. *Introspection in Second Language Research*. Clevedon:Multilingual Matters.

Felix, S. & W. Weigl. 1991. Universal grammar in the classroom: the effects of formal instruction on SLA. *Second Language Research* 7(2):162-81.

Fodor, J. 1983. *The Modularity of Mind*. Cambridge, MA:MIT Press.

Gomes de Matos, F. 1983. Implicações pedagógicas de idéias psicolingüísticas sobre a leitura. *Cadernos PUC*. São Paulo:Cortez. pp. 51-8.

Gregg, K. 1984. Krashen's Monitor and Occam's Razor. *Applied Linguistics* 5(2):79-100.

Halliday, M.A.K. 1985. *An Introduction to Functional Grammar*. London: Edward Arnold.

Hyltenstam, K. & M. Pienemann (eds.). 1985. *Modeling and Assessing SL Development*. Clevedom Avon: Multilingual Matters.

Jackendoff, R. 1987. *Consciousness and the Computational Mind*. New York:Academic Press.

Klein, W. 1986. *Second Language Acquisition*. Cambridge:CUP.

Krashen, S. 1979. A response to McLaughlin, 'The monitor model: some methodological considerations'. *Language Learning* 29:151-67.

Krashen, S. 1985. *The Input Hypothesis: Issues and Implications*. New York: Longman.

Krashen, S., J. Butler, R. Birnbaum & J. Robertson. 1978. Two studies in language acquisition and language learning. *ITL: Review of Applied Linguistics* 39-40:73-92.

Krashen, S. & T. Terrell. 1983. *The Natural Approach: Language Acquisition in the Classroom*. Oxford:Pergamon.

Lamendella, J. 1977. General principles of neurofunctional organization and their manifestation in primary and secondary language acquisition. *Language Learning* 27:155-96.

Larsen-Freeman, D. 1991. SLA research: staking out the territory. *TESOL Quarterly* 25(2): 315-50.

Larsen-Freeman, D. & M. Long. 1991. *An Introduction to Second Language Acquisition Research*. New York: Longman.

McLaughlin, B. 1978. The monitor model: some methodological considerations. *Language Learning* 28(2):309-32.

McLaughlin, B. 1987. *Theories of Second-Language Learning*. New York:Edward Arnold.

McLaughlin, B. 1990a. 'Conscious' versus 'unconscious' learning. *TESOL Quarterly* 24(4): 617-33.

McLaughlin, B. 1990b. Restructuring. *Applied Linguistics* 11(2):113-28.

McLaughlin, B., T.Rossman, & B. McLeod. 1983. Second language learning: an information-processing perspective. *Language Learning* 33(2): 135-58.

McLeod, B. & B. McLaughlin. 1986. Restructuring or automaticity? Reading in a second language. *Language Learning* 36(2):10-23.

Meichenbaum, D. & J.B. Gilmore. 1984. The nature of unconscious processes: a cognitive-behavioral perspective. In: Bowers, K.S. & Meichenbaum (eds.)

Meisel, J., H. Clahsen, and M. Pienemann. 1981. On determining developmental stages in natural SLA. *Studies in Second Language Acquisition* 3(2):109-35.

Webster. 1980. *New Collegiate Dictionary*. Springfield, MA:G. & C. Merriam Company.

Paradis, M. 1985. On the representation of two languages in one brain. *Language Sciences* 7(1): 1-39.

Paradis, M. 1987. Neurolinguistic perspectives on bilingualism. In *The Assessment of Bilingual Aphasia*. Hillsdale, New Jersey:Lawrence Earlbaum Associates.

Paradis, M. 1993. *The Organization of Two Languages in One Brain*. Lectures given at the ISAPL -- International Seminar on Psycholinguistics, Federal University of Santa Catarina, Florianópolis, Brazil, 4-15 January.

Paradis, M. In print. Neurolinguistic aspects of implicit and explicit memory: implications for bilingualism. In N. Ellis (ed.) *Implicit and Explicit Language Learning*.

Piatelli-Palmarini, M. (ed.). 1980. *Language and Learning: The Debate between Jean Piaget and Noam Chomsky*. Cambridge, Massachusetts: Harvard University Press.

Pienemann, M. 1984. Psychological constraints on the teachability of languages. *Studies in Second Language Acquisition* 6(2):186-214.

Pienemann, M. 1989. Is language teachable? Psycholinguistic experiments and hypotheses. *Applied Linguistics* 10:52-79.

Prabhu, N. 1987. *Second Language Pedagogy*. Oxford:OUP.

Reber, A. 1985. *The Penguin Dictionary of Psychology*. London:Penguin Books.

Reber, A.. 1989. Implicit learning and tacit knowledge. *Journal of Experimental Psychology: General*. 118(3):219-35.

Richards, J., J. Platt & H. Weber. 1985. *Longman Dictionary of Applied Linguistics*. Hong Kong:Longman.

Rothenberg, M. A. & C. F. Chapman. 1989. *Dictionary of Medical Terms for the Nonmedical Person*. New York:Barron's Educational Series.

Rumelhart, D. E. & D. A. Norman. 1978. Accretion, tuning, and restructuring: three modes of learning. In J. Cotton & R. Klatzky. *Semantic Factors in Cognition*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Rutherford, W. E. & M. Sharwood Smith. 1985. Consciousness-raising and Universal Grammar. *Applied Linguistics* 6:274-82.

Schachter, J. 1990. On the issue of completeness in SLA. *Second Language Research* 6(2):93-124.

Schneider, W. & R.M. Shiffrin. 1977. Controlled and automatic human information processing: I. Detection, search and attention. *Psychological Review* 84:1-66.

Scliar-Cabral, L. 1991. *Introdução a Psicolingüística*. Sao Paulo: Atica.

Seliger, H. 1978. Implications of a multiple critical period hypothesis for second language learning. In W. Ritchie (ed.). *Second Language Acquisition Research*. New York: Academic Press. 11-9.

Seliger, H. 1979. On the nature and function of language rules in language teaching. *TESOL Quarterly* 13(3), 359-69.

Seliger, H. 1983. The language learner as linguist: of metaphors and realities. *Applied Linguistics* 4(3), 179-91.

Shiffrin, R.M. & W. Schneider. 1977. Controlled and automatic human information processing: II. Perceptual learning, automatic attending and a general theory. *Psychological Review* 84(2):127-90.

Sharwood Smith, M. 1986. Comprehension versus acquisition: Two ways of processing input. *Applied Linguistics* 7(3):239-56.

Sharwood Smith, M. 1991. Language models and bilingual processing. In E. Bialystok (ed.)

Sharwood Smith, M. 1993. Input enhancement in instructed SLA. Theoretical Bases. *Studies in Second Language Acquisition* 15:165-79.

Slobin, D. I. 1973. Cognitive prerequisites for the development of grammar. In: Ferguson, C.A. and D.I. Slobin (eds.) *Studies of Child Language Development*. New York:Holt, Rinehart & Winston.

Snow, C. In press. Bilingualism and Second Language Acquisition. In J. Berko Gleason & N. Bernstein Ratner (eds.) *Psycholinguistics Today*. New York: Holt, Rinehart and Winston.

White, L. 1990. SLA and UG. *Studies in Second Language Acquisition* 12:121-34.